The Foundry

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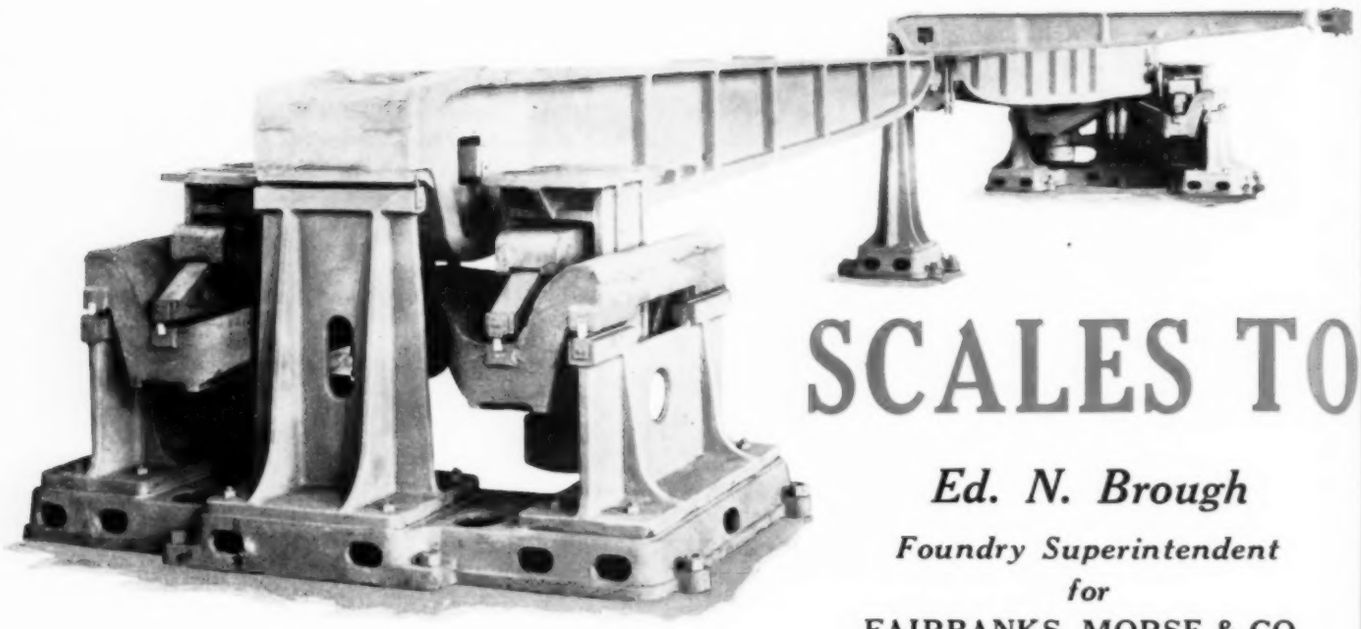

SCALES TO

Ed. N. Brough

Foundry Superintendent
for
FAIRBANKS, MORSE & CO.,
ST. JOHNSBURY, VERMONT

writes:

"This picture (above) shows a complete scale, set up. The sub-base on each end contains a large number of cores and these castings weigh 4,000 pounds each. The large levers in this picture are 27 feet long and weigh 14,000 pounds each. This scale is the largest one we make and has a capacity of 500 tons. It is used for weighing ladlecars of molten steel.

"The other picture (opposite page) shows a lever 29 feet in length weighing 5 tons. There is a cored section in the large end.

"In these Castings we are very careful to use the best oil in the cores and find Linoil is the best we can get for the purpose."

THE WERNER G.

(DIVISION OF ARCHER -

2191 WEST 110th ST. *Warehouse*

Boston, Mass.	Philadelphia, Pa.	Columbus, Ohio	Chicago, Ill.
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The Foundry Editorial

Education, Good Housekeeping Will Reduce Accidents

REMARKABLE progress has been made by foundries during the past decade in reducing the number of accidents among workers. According to a recent report of the National Safety council based on data collected from its members, foundries have reduced the frequency of accidents 55 per cent and the severity 73 per cent since 1926. Compared with all industries, where the improvement during the same period has been 61 per cent for frequency and 42 per cent for severity, the foundry record has been splendid.

Nevertheless, reports for 1937 indicate much remains to be done in accident prevention. During that year, foundries averaged 25.63 for frequency and 1.65 for severity, as based on reports from 115 plants which worked 118,519,000 man hours. These rates are higher than the average of 13.85 for frequency and 1.58 for severity in all industries. The foundry average showed no change in frequency over 1936, but indicated an increase of 10 per cent in severity, contrasted with a reduction of 2 per cent by all industries. Frequency rate is the number of disabling injuries per 1,000,000 man-hours of exposure, and the severity rate is the number of days lost as the result of disabling injuries per 1000 man-hours of exposure.

Analysis of accident causes over the past four years, as contained in the report of the council, emphasizes importance of enlarging efforts in safety education and good housekeeping practices. More injuries were caused by machinery than by any other agency.

Practically half of all accidents reported may be classified under the heading *caught in or between*. In the case of machinery, the worker had fingers or hands caught between moving parts. The second largest class of accidents resulted from *falling, sliding or flying objects*. As would be expected, these accidents occurred chiefly when materials were being handled either by mechanical means or by hand.

Need for good housekeeping practices is well illustrated by the fact that 43 per cent of all accidents in foundries reporting were caused by *hazardous arrangement*. The report states "Unsafe methods of planning and performing work, unsafe practices, unsafe piling of equipment and materials, and congestion of working places were the principal causes of that type of accident." Considering that good housekeeping may be practiced at no additional cost, but rather will result in lower operating costs as well as greater safety to workers, no management should permit the continuation of accidents due to hazardous arrangement. An example of good housekeeping accomplishment is presented on page 22 of this issue.

Of course the human factor continues to be a major cause of industrial accidents. The employe with the wrong attitude may be injured, principally through not following instruction, being reckless, or not keeping his mind on the work. For the most part, injuries due to personal causes may be reduced through proper education and supervision.

Conferences Provide Values

FIVE regional foundry conferences sponsored jointly by the A.F.A., various chapters of that organization and several local foundry associations, will be held this fall. The fall technical conference of the A.F.A., to be held this year at the University of Michigan, Ann Arbor, Mich., on Sept. 15, 16 and 17, will open the series. That meeting will be followed by conferences at the Missouri School of Mines, Rolla, Mo., Oct. 7 and 8; the State University of Iowa, Iowa City, Iowa, Oct. 14 and 15, Purdue university, Lafayette, Ind., Oct. 27, 28 and 29; and Cornell university, Ithaca, N. Y., Nov. 25 and 26. Several other regional conferences will be held after the first of the year.

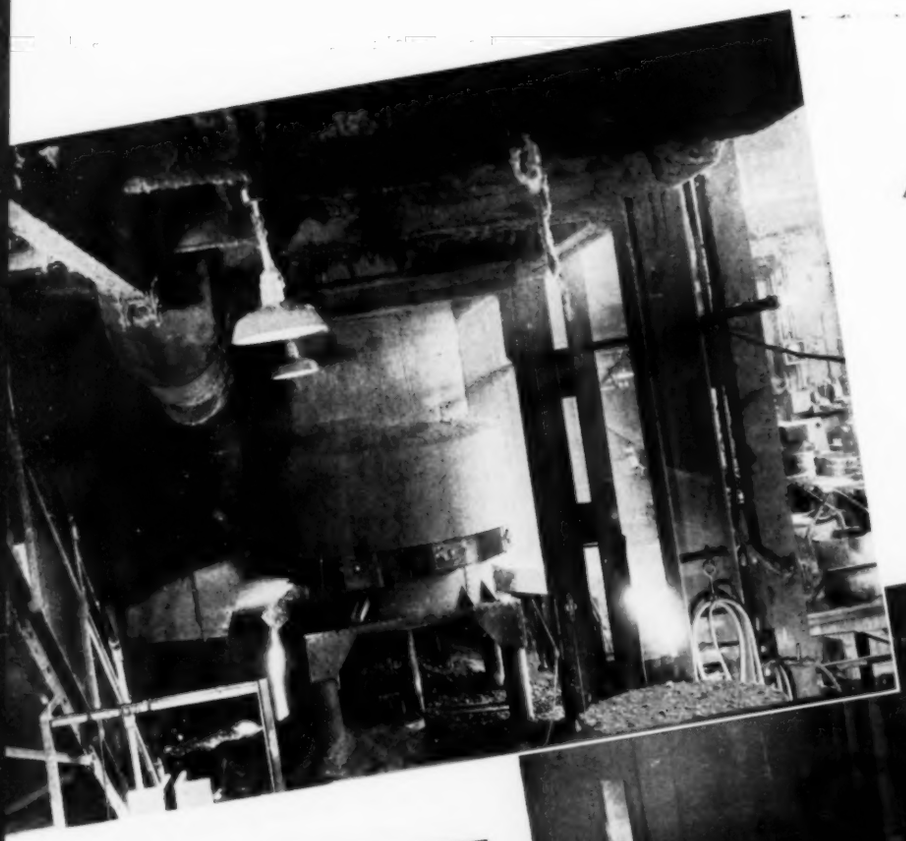
Program for the Michigan meeting, as may be noted on page 72 of this issue, will deal entirely with technical phases of foundry developments, while programs for the other regionals will feature both practical and technical details of casting production.

Chapters and local foundry association through regular monthly meetings, render an important contribution to industrial progress by furthering foundry knowledge and acquaintanceship. Regional conferences go a step further by permitting many more foundrymen to benefit from group activities. Success of such conferences may be judged by the frequent shattering of attendance records. During the 1937-38 season a total of 2150 foundrymen attended 8 regionals held in the East, Middle West and South.

The conference programs already announced are exceptional in quality and scope. With such opportunities offered, management should see that key men attend the nearest regional conference.

Frank G. Steinebach
Editor

Good



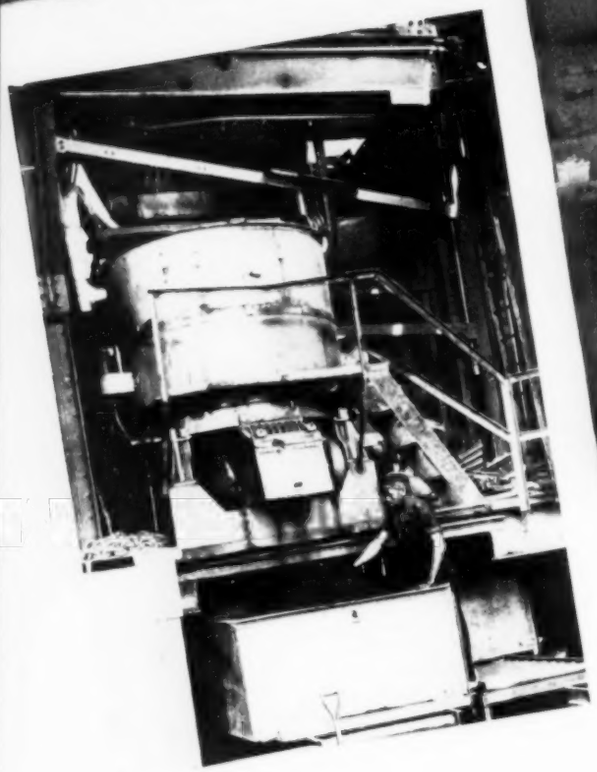


Fig. 1 (Above)—Slag wool is drawn away through a funnel at the back of the cupola.. Fig. 2 (Right)—Auxiliary spout carries metal to a mixing ladle. Fig. 3 (Left)—Sand from the muller is aerated before it falls into the tote box. Fig. 4 (Opposite page left)—Shows former conditions in cleaning room. Fig. 5 (Upper right)—Mild exhaust maintained in tunnel under shakeout. Fig. 6 (Lower right)—Modern shakeout where a current of air draws all dust away from casting and operator

SEVERAL photographs reproduced on these pages illustrate more graphically than any written description the difference between present operating conditions and those which prevailed previously in the foundry department of the Otis Elevator Co., Yonkers, N. Y. Changes in methods and installation of extensive mechanical equipment were accomplished without any cessation of production.

Two foundries, one devoted to the production of gray iron and the other, in a separate building to the production of nonferrous castings are located approximately in the center of a great manufacturing plant covering several city blocks. Since expansion of the iron foundry to meet increasingly heavier production schedules over a period of years was hampered by the proximity of other buildings, recourse was had to establishing a second floor above the first. In addition to the conveyor lines and molding floors occupying the greater part of the area on the second floor, this

Housekeeping Features Two-Storey Foundry

By PAT DWYER

section of the foundry also houses the department for making small cores, all the sand handling equipment and a wet type dust collector. All the larger molds are made on the first floor, while the smaller molds in snap flasks and in solid flasks are made on the second floor.

Metal is supplied from two cupolas, one on each floor. Metal on the lower floor is distributed by the crane over the main floor. For the floors on an *L*-addition extending across one end, the ladle is placed on a recessed trailer pulled by an electric truck. In the *L*-section the ladle is picked up by a crane and poured.

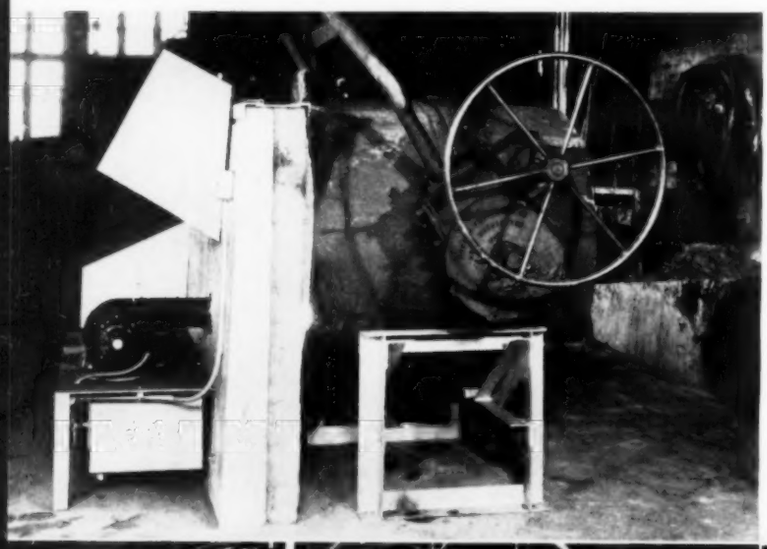
On the second floor a 1000-pound capacity cylindrical ladle takes metal directly from the cupola spout and distributes it to a number of 400-pound capacity ladles for pouring the squeezer molds. A second 1000-pound ladle on a crane takes metal direct from the spout and pours it directly into larger molds in tight flasks.

When decision was arrived at to revamp the foundry,

W. O. Moyer, an engineer of wide experience and connected with the company for many years was appointed foundry manager. As a result of his efforts the foundry was cleaned up and rearranged, mechanical and hygienic equipment was installed. Definite systems of control were established in all departments from those dealing with incoming raw materials to shipment of the finished castings either to the stock pile or machine shop.

Figuring prominently in the original cleanup program and periodically afterward in the maintenance of this condition is a vacuum type dust collector made by the U. S. Hoffman Machinery Corp., New York. Chassis of this self contained portable unit is mounted on wheels to facilitate movement to any desired section not only of the foundry, but to other departments of the plant. The device also is provided with suitable attachment through which it may be suspended from the crane while in operation. Dust laden air enters the primary separator near the top opposite a circular baffle plate. Vertical action aided by an abrupt reduction in velocity as the air enters the separator chamber precipitates all the heavier material to the bottom of the chamber. It is claimed that from 90 to 95 per cent of all dust entering the system is retained in the primary separator. The remaining fine, light dust is caught in dust bags in the upper part of the second chamber.

Permanent, stationary dust collection equipment made by the W. W. Sly Mfg. Co., Cleveland; American Foundry Equipment Co., Mishawaka, Ind.; National Engineering Co., Chicago; and the American Air Filter Co., Louisville, Ky.; functions over the sandblast



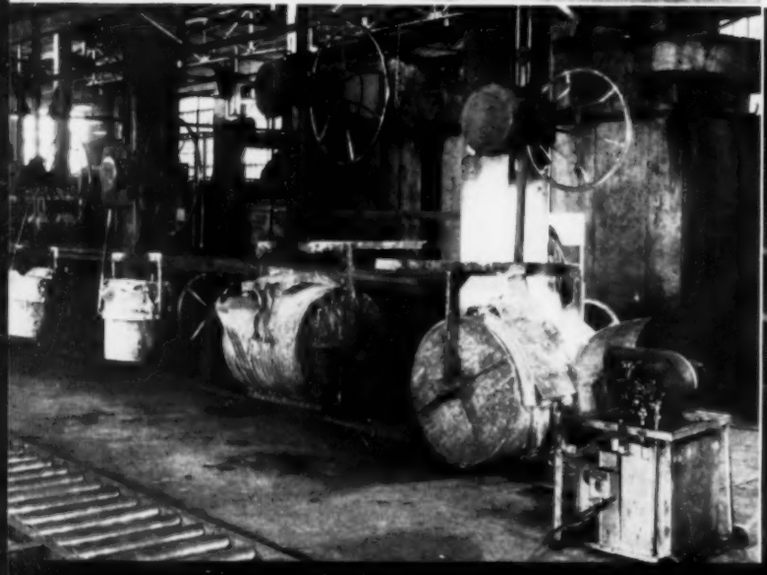


Fig. 7 (Above)—General view of nonferrous melting plant under former conditions. Fig. 8 (Left)—Large ladles are heated with a stationary oil burner. Fig. 9 (Left below)—A portable oil burner is employed to heat the smaller ladles. Fig. 10 (Below)—Under former conditions the ladles were dried with wood fires

units in the cleaning room; the facing sand preparation unit and the shakeout station. The combined exhaust fan and precipitator supplied by the American Air Filter Co., for service at the shakeout station on the second floor, uses a water spray to wet the dust particles and thus obtain high collection efficiency. This unit exhausts 11,000 cubic feet of air per minute; 5200 from the shakeout, 2700 from the sand screen, 1200 from the magnetic pulley, 700 from the elevator head and 1200 from the sand screen discharge to the belt conveyor.

Air, smoke, steam and fumes from the shakeout are drawn through suitable piping to the precleaner where a preliminary wetting removes a high percentage of the dust. The air then is conducted to a special type inlet and second spray nozzle where the remaining fine dust is removed by precipitation on the numerous specially shaped wetted blades of the impellor. Collected dust and water flow to a hopper beneath the precleaning section where the dust settles out and the water flows to a drain connection. Settled dust continuously is removed by a scraper type conveyor which discharges the sludge to a suitable container. In this manner no secondary dust problem arises.

Incidentally while on the subject of dust collection it is interesting to note that a device has been erected at the back of the cupola, as shown in Fig. 1, for collecting the slag wool. A rectangular, horizontal, tapered sheet steel funnel is suspended from a beam and swivel jointed to a pipe leading to a dust collector. A suction fan draws the wool through the pipe and deposits it in a collection cham- (*Please turn to page* 54)

Fig. 11 (Above)—Modern melting plant offers marked contrast to that on opposite page. Fig. 12 (Right)—View showing former appearance on upper molding floors. Fig. 13 (Below)—After the molds are poured they are placed on the long conveyor and taken to the shakeout. Fig. 14 (Right below)—Molds are made on a battery of molding machines extending along one side of the shop. The molds are placed on roller conveyors

How Does Your

Fig. 1—Sand on left shows particles of iron while that in the center shows a buckle. Sand at the right depicts a scab

By HARRY W. DIETERT
President
Harry W. Dietert Co., Detroit

IT has been said that to save the mold surface is to save all. This statement is not far from correct when it is considered that, providing the mold surface does not peel off, crack, buckle, burn-on, scab, cut or pull down, a foundryman is quite certain of producing a good casting.

Object of this article is to familiarize foundrymen with the way in which molding sands and cores may be tested at high temperatures to determine how the sand will behave when heated to temperatures identical to that of the molten metal.

Sand to be tested is rammed with a sand rammer, in the form of a cylindrical sand specimen 2 inches in length. For tests discussed in this presentation 1⅛-inch diameter specimens were used. Equipment was also available to test specimens 2 inches in diameter. Test results agreed closely for the two different sized specimens. However, the time required is much less for the 1⅛-inch diameter specimen so it was used in the investigation.

Rammed sand specimens were inserted in the dilatometer shown in Fig 5, and the furnace of dilatometer at 2500 degrees Fahr. was quickly lowered around the sand specimen to simulate mold conditions. Expansion or contraction of sand specimen was determined from the dial indicator and recorded in thousandths of an inch per linear inch of the sand specimen. Tests also were conducted where the sand specimen was heated gradually at the rate of 10 degrees per minute.

Silica sand grains expand when heated. This expansion may be as large as 0.040 inch per linear inch for very refractory oil bonded cores or there may be no expansion because the expansion of the sand grains may be canceled by substances which contracted more than the sand grains expanded.

Clay bond contained in a molding sand or core sand will contract when heated to elevated temperatures.

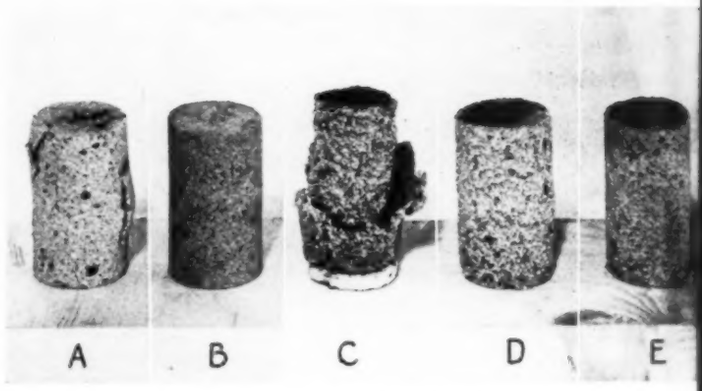


Fig. 2—Sand A at left produced rat tails while sand B at right was free from that defect. Fig. 3—Sand C at left exhibits buckle defect. Sand D in center has been improved by addition of cereal binder. Sand E at right to which clay bond was added is free from buckling

Bonds of low refractoriness start to contract at temperatures as low as 1600 degrees Fahr. while others of high refractoriness may require temperatures as high as 2400 degrees Fahr. Cereal binders, sea coal, wood flour and other combustible materials will burn out at a fairly low temperature leaving voids in the mold mass. The expanded sand grains may move into these voids, thereby cancelling or reducing expansion. Most clay bonds in sand may be considered as fluxing elements in connection with silica. Therefore, the greater the quantity of bond present, the lower the refractoriness and the greater the contraction. Expansion of a molding sand starts at temperatures as low as 500 degrees Fahr. and continues up to a possible temperature of 1600 degrees Fahr. Therefore, sand first expands at relative low temperatures. Face of the mold may go through its expansion cycle in a few seconds before a mold is poured completely. Contraction cycle follows the expansion cycle and requires a considerably larger quantity of heat at high temperature. It is apparent then that the mold surface goes

through a contraction cycle only on relatively large castings poured with hot metal.

Heat flow through a sand substantially varies directly in proportion to permeability. As the permeability of mold surface increases, the heat flow into the sand increases, causing greater contraction. Thus, mold dusts and washes help to reduce contraction.

In this study one important condition to remember is that timing of the two opposing volume changes also will affect the stresses imposed on the mold surface. Where a high sintering bond is used, contraction will start late in the cycle and the amount of contraction will be small. This condition would be desirable for hot metal and large castings. When a low sintering clay is used in large quantities, contraction will take place early in the cycle and the amount of contraction probably will be large enough to pull mold surface apart, allowing molten metal to flow behind a peeling of the mold surface. When a low sintering type of clay is employed a small quantity should be used to help to increase the sintering temperature. Work the sand at a conservative strength, for example, 6.5 pounds green compression.

Sand Behave?

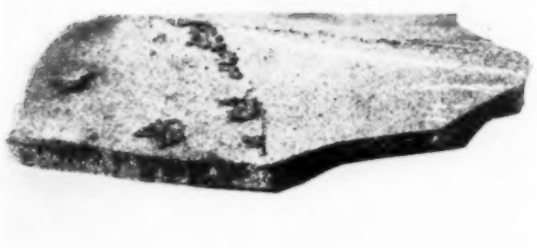


Fig. 4—A casting defect showing rat tail and scab defects at same location

In the case of light castings the quantity of heat imparted to the sand is small, just sufficient to expand the sand grains in most cases. The sand grains in a mold of that type should be saturated well with a clay bond to minimize the expansion. Such molding sand should not be worked at low strength, such as, 4.5 pounds but at 6.5 to 7.5 pounds, and rammed to a medium-soft mold hardness of 55 to eliminate the usual *rat tail* defect.

The following statements are the result of many tests on sand producing good and defective castings. Sand specimens shown in Fig. 1 prove helpful in visualizing what occurs on the surface of a mold when a mold is poured. The sand specimens were subjected to a shock immersion temperature of 2500 degrees Fahr. Sand specimen at the left shows iron shots which bleed from the interior of the specimen. Note also cracks into which molten metal could flow causing *fissures*.

Sand specimen in the center shows surface of the sand peeled off due to a compressive force imparted by expansion of sand grains. That defect of the sand would result in a *cope pull-down* or *buckle*. Radiated heat from molten metal against cope of mold is just sufficient to cause sand grains to expand rapidly.

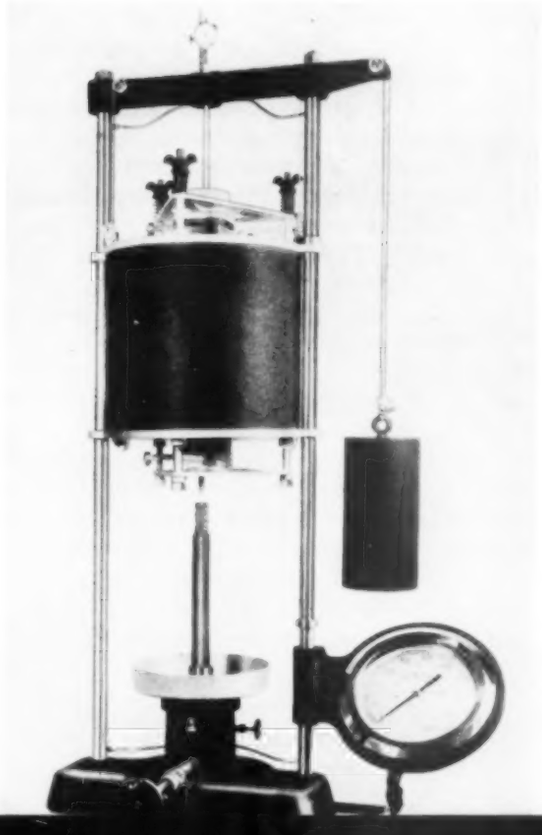
The third specimen on the right in Fig. 1 was subjected to 2500 degrees Fahr. for a longer period as would be the case in a mold for a heavy section casting. The sand composition was just proper to cause the sand to have a high expansion and contraction. A portion of the sand specimen peeled off and then the contraction of the specimen opened up that portion of the sand. If molten metal were present then it would flow behind the peeled off portion and cause a *scab defect*.

Sand Will Show Cracks

Testing sand that produces rat tail defects and sand that works well on light sectioned casting, it was found that the sand that rat tailed would show cracks when subjected to the dilatometer test. In Fig. 2 the sand (*A*) at the left side produced rat tail defects, while the sand (*B*) on the right did not produce rat tails. It is free of surface cracks when subjected to the dilatometer test. When the green strength of the sand (*A*) is increased to 6.5 pounds green compression, the sand will hold together and not rat tail. This increase of strength also will cause sand to ram to the required mold hardness without having the sand grains compressed so closely. Data on sands *A* and *B* are presented in Table I.

Since a *buckle defect* frequently appears in copes of molds made with a sand low in bond due to a large

Fig. 5—Dilatometer for measuring expansion and contraction of sands when subjected to elevated temperatures



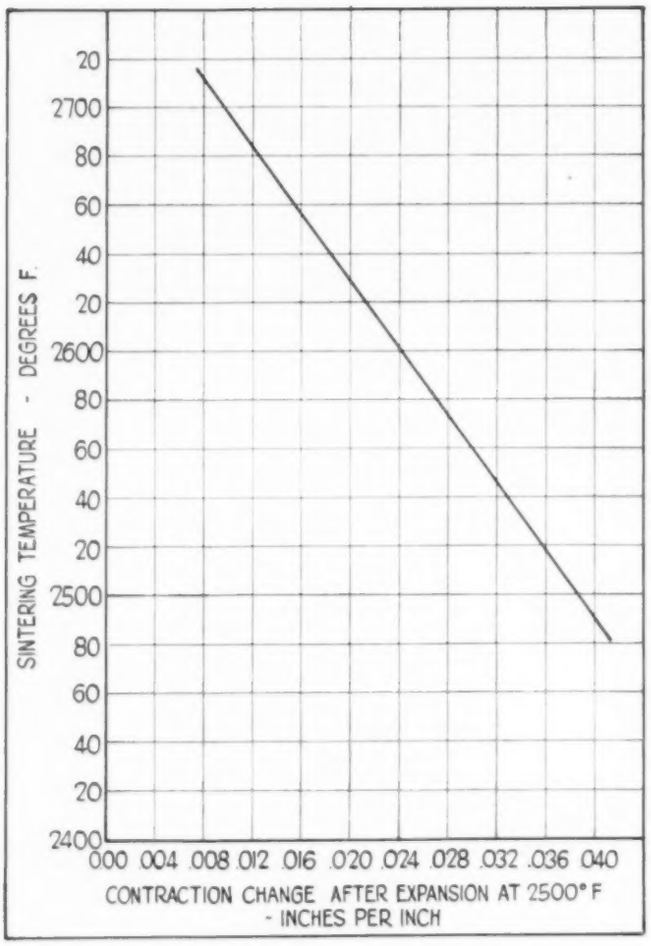


Fig. 6—Relationship between sintering point and linear change in contraction after expansion at 2500 degrees Fahr. for crude and washed silica sand

percentage of expanding silica being present, a very instructive series of sand specimens is shown in Fig. 3. Data on the sands shown in the illustration are presented in Table II. The sand (*C*) produced numerous large buckle defects on the cope side of a casting. Note how the outer surface of the sand specimen peeled off. This peeling took place immediately when the sand was subjected to a temperature of 2500 degrees Fahr. It was impossible to obtain accurate expansion readings of this sand in that the specimen would break up as soon as it was inserted in the furnace of the dilatometer. Contraction of the sand specimen after the sides peeled off read minus 0.022-inch. Two per cent cereal binder was added to this same sand producing a marked improvement as may be observed in sand (*D*). The improvement is due to the fact that cereal binder increases the flexibility of the sand. That sand had an expansion of 0.008-inch and a contraction of minus 0.012-inch. The buckle defect was absent in sand (*E*) where 3 per cent clay bond was added to increase the quantity of contracting material. The sand had an expansion of 0.0145-inch and a contraction of minus 0.009-inch.

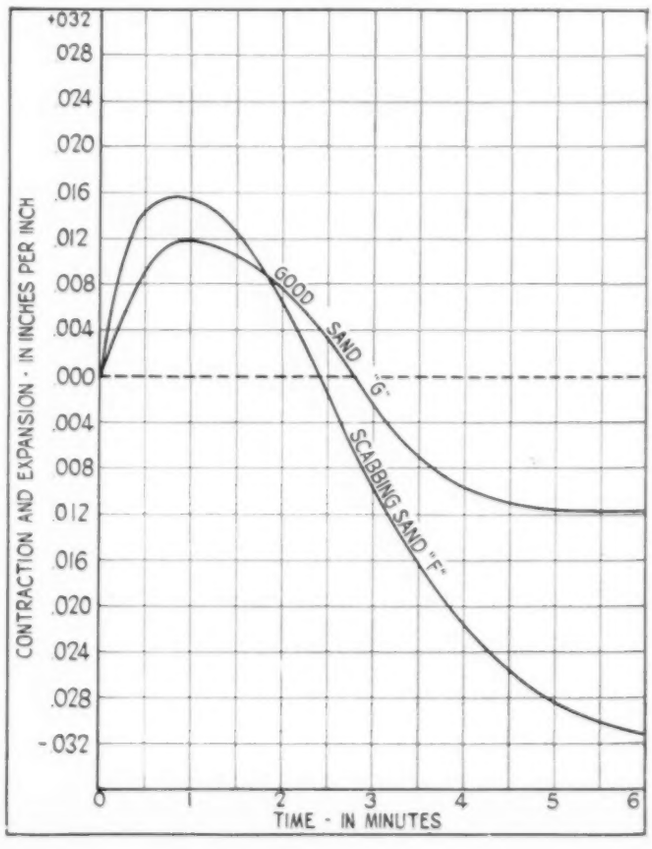
A mold surface first goes through an expansion volume change and then through a possible contraction volume change. Fig. 4 shows a casting defect, a clearly defined expansion defect (rat tail), and also several small scabs. Amount that a sand will contract probably is controlled greatest by the sintering temperature of a sand. Contraction of a sand increases as the sintering temperature decreases. Fig. 6 gives a graphical presentation of this relation. Table III tabulates test data covering sand (*F*) that produced scabs and sand (*G*) that did not scab. These two sands are composed of the same sand grains and type of bond. However, the sand (*F*) has a greater percentage of clay resulting in a greater green and dry strength. Clay bond is a fluxing element in a sand and the larger the quantity, the lower the sintering temperature.

Results of Sintering Tests

Sand (*F*) has a sintering temperature of 2356 degrees Fahr. and sand (*G*) a sintering temperature of 2588 degrees Fahr. The dilatometer test shows that sand (*F*) expands 0.019-inch and then contracts 0.028-inch, while sand (*G*) expands 0.012-inch and contracts 0.011-inch. Note Fig. 7. The sand (*F*) will scab while sand (G) will not produce scabs. The sand (*F*) may be improved by lowering the green strength to 7.5 pounds which will increase the sintering temperature and reduce contraction.

Manner in which a sand is compounded yields a limited control of the dimensional stability of a molding sand. A further control may be obtained by selection of materials used. Dilation curves shown in Fig. 8, cover expansion and contraction of three different sands as temperature was (*Please turn to page* 62)

Fig. 7—Relationship between linear change in length and time at 2500 degrees Fahr.



Among Detroit Foundries

Ventilating system at the rear of the mold line and ducts over the workmen remove fumes, dust and heat, and supply fresh cooled air in foundry of Pontiac Motor division, General Motors Corp., Pontiac, Mich. Molds move along the line while workmen operating ladles ride on an escalator synchronized with the mold travel. Capacity is 120 blocks per hour

DECKS have been cleared for action in automobile plants and the 1939 model season now is practically in full swing. For foundries this has meant an important fillip to operations, and throughout this territory pouring floors flicker with yellow light as molten iron cascades into an unending line of molds.

Foundry activity on new model dies and parts naturally has antedated assemblies by many weeks, since the foundry is one of the first departments to be started when a new model run begins. For example, in the case of body dies, many foundries in Detroit were busy back in April and May, although even in the past month there have been some new body dies cast—Ford for one putting these units through.

Also in production have been a number of fender and body dies for the new Crosley car which appears destined for appearance sometime this fall. Sponsored by the Crosley radio interests in Cincinnati, this will be a small car in the true sense of the word, advance dope giving the wheelbase as 61 inches, motor a 2-cylinder affair with economy of 50 miles to the gallon. The car, it is understood, will be produced in the Crosley plant at Richmond, Ind., and initial output will be 25,000.

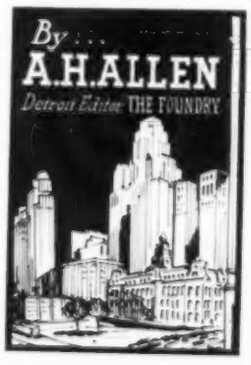
Development work on the Crosley *jitterbug* has been kept very quiet, and in many cases it has been denied that such a car is in the works. But in view of the fact body dies are being cast, and parts releases made in a few instances, it seems reasonable to expect assemblies are not far off. A local body builder probably will supply complete bodies for the car, and at the start it is said only a 2-passenger coupe will be offered.

Earlier this year reports were heard that a number of builders had readied small cars for production. Ford practically had completed engineering work on a light model which was to use a chassisless tubular steel frame, the present 60-horsepower motor, a dual driveshaft and other innovations. A large section of the Ford foundry had been cleared out and concrete foundations poured for a new casting line on the special type of banjo housing developed for the car. Suddenly, on orders from the front office all work was dropped, and the gaping hole remains in a central part of the Ford foundry.

Best opinion as to why the project was dropped is that study of car sales showed people with incomes in the class which might be expected to buy such a car were either without jobs, or on sharply reduced earnings, so that they were not prospective buyers. Ford sales had completely reversed the trend of 1937 when the standard model was outselling the deluxe by a margin of 2 to 1, and this year the deluxe outsold the standard by about 3 to 1. Hence it was reasoned that to introduce a still cheaper car at present would be foolish.

Other makers had *stripped* models or small cars ready to spring in the event Ford went ahead with his plans. Nash practically had completed all engineering work on a small car, similar to the small Ford. Chrysler and General Motors had shrunken versions of the Plymouth and Chevrolet ready to offer. All these projects were canceled.

In the past few months the situation has changed sharply again. Dealers have been practically cleared of new cars, and even used cars are scarce in some localities. In Detroit it is said to be impossible to buy so-called wreckers any more, and prices of good used cars are anywhere from $150 to $250 above the level prevailing this spring.



Hence the word is being passed around to look for a revival of these small car programs after Sept. 1. Men are going back to work. The federal government is continuing to dump billions into employment projects, and with all these workers transportation has come to be just as much of a necessity as food and clothing. As soon as they have a steady income they will be in the market for cars; and with used cars growing (*Please turn to page* 60)

Alloy Steels Designed for Specific Applications

By VINCENT T. MALCOLM
Metallurgist
Chapman Valve Mfg. Co., Indian Orchard, Mass.

HEAT treatment is an operation or a combination of operations involving the heating and cooling of the steel castings in the solid state for the purpose of obtaining desirable conditions or properties. Quality of the steel casting depends upon the production of a uniformly heated and cooled casting in a suitable heating or cooling atmosphere.

A uniformly heated casting requires first the application of heat uniformly to the entire surface of the charge; second, heating the charge at the proper rate of the correct temperature as indicated by the critical point of the steel or by the properties desired, and third, holding the charge of castings at the correct temperature for the period of time necessary for complete saturation as determined by the surface exposed, the mass to be heated, the conductivity of the metal, and the grain structure desired.

Heat treatment of castings involves such treatments as (1) annealing, (2) normalizing and drawing, (3) spheroidizing, (4) quenching in a liquid medium, (5) step normalizing, followed by drawing. These treatments may be subdivided again into double annealing, double normalizing, normalizing, followed by annealing, and normalizing followed by quenching.

Annealing may be defined as a uniform heating above the critical temperature followed by relatively slow rate of cooling, the object being the production of a steel having softness and ductility.

Normalizing may be defined as heating above the critical temperature followed by an intermediate rate of cooling, the operation being merely for the purpose of refining the grain and obtaining uniformity.

Drawing or tempering may be defined as reheating, after normalizing, to some temperature below the critical range, followed by the cooling as desired.

Spheroidizing is a combination of normalizing followed by drawing for a considerable length of time. The purpose of this treatment is to give the casting high ductility and toughness.

Quenching may be defined as heating above the critical temperature followed by quick cooling in a liquid medium. By quenching and drawing, maximum refinement of grain and strength may be obtained.

Step normalizing, followed by drawing, is used on the treatment of a number of alloy steels and is a treatment in which the material is held for a considerable length of time just below the critical temperature, and then quickly moved into the critical range for a short time and air cooled, followed by drawing. By this treatment, network structures, so detrimental to alloy steels, are

This is the third of three articles from a paper presented by the author at the Northwestern New York Regional conference held at Cornell university, Ithica, N. Y. The first article appeared in July and the second in August

stration courtesy Sivyer Steel Casting Co., Milwaukee

broken up with maximum refinement of grain, and high strength, combined with ductility and toughness, is obtained.

All these particular heat treatments have their place in the foundry and are used for various designated purposes, such as maximum softness and machineability, high impact value, maximum strength, and toughness. The relation of the difference in properties due to different treatment varies in different steels, but as a rule, the same relation that holds for any specific steel may be taken as the average value.

Ductility in untreated steels usually is inversely proportional to the percentage of the carbon or the alloy present. The higher the temperature above the critical point in the normalizing or annealing of steel castings usually gives slightly better elongation with corresponding decrease in the tensile strength and yield point.

Double annealing usually increases the yield point and elongation, and has a very marked effect on the improvement of impact properties.

Normalizing, followed by annealing, increases the yield point and gives ductility values equal to those obtained by annealing. Normalizing, either single or double treatment, followed by tempering, increases the yield point and the reduction of area. Single normalizing, followed by tempering, gives slightly less elongation than that obtained by annealing. Double normalizing and tempering gives elongation somewhat less than double annealing, but the reduction of area, yield point, and impact properties are higher than obtained by any other method of treatment.

If the physical properties specified are within certain narrow limits, normalizing, followed by tempering, is the best treatment, as the tempering treatment can be varied to meet the requirements.

Spheroidizing increases the ductility, but generally it causes a large drop in yield point and tensile strength, and to be able to take full advantage of spheroidizing treatment, the steel must be at the spheroidizing temperature for a long period of time.

Water quenching, followed by drawing, gives maximum refinement of structure, coupled with the greatest possible strength. It is necessary to point out, however, that due to the intricate design of castings, particularly on account of the mass and thick and thin sections, the castings may crack due to the drastic quench, or if held in the water or oil until completely cool.

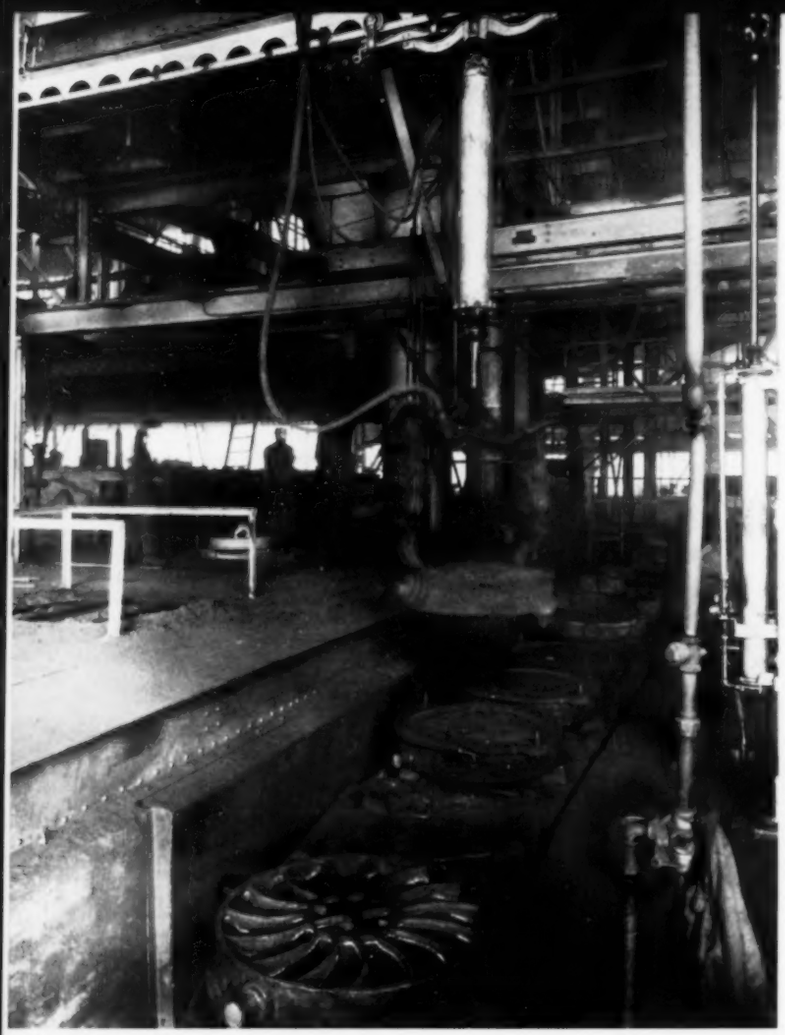
Remove Castings at Black Heat

Therefore, the castings must be removed from the quench when they have reached a black heat and immediately charged into the tempering furnace which has been heated to approximately the same temperature as the casting. Again, due to the mass and design of most castings, the advisability of attempting to quench is to be questioned, for in our judgment, it is excellent for test bars and small castings, but an attempt to apply this method of heat treatment to intricate castings without taking extreme precautions for each type of casting, can only result in the loss of many castings through the development of cracks and strains.

These cracks are microscopic in character in most instances, and are difficult to find by either a visual or hydrostatic test, because they may only extend for a short distance into the section, and the section itself may be of such strength and toughness that the cracked portion may be well able to withstand the hydrostatic test without any visible sign of cracking. Yet, when the castings are placed in service, they fail prematurely.

In the treatment of certain types of alloy steels, particularly those containing chromium, molybdenum, and tungsten, the author, with Dr. Wescott, Gulf Refining Co., developed what may be called the *step normalizing* treatment, which has produced results in the strength and toughness of steel castings. Network structures so prone in alloy steels have been eliminated by this particular treatment which consists of treating the steel at some length below the critical point and then moving into a temperature in excess of the critical point for a short time and air quenching.

In the treatment of numerous alloy steels, there is a wide spread between the beginning of the reaction on heating, and the completion of (*Please turn to page* 65)



Trains Run on

By PAT DWYER

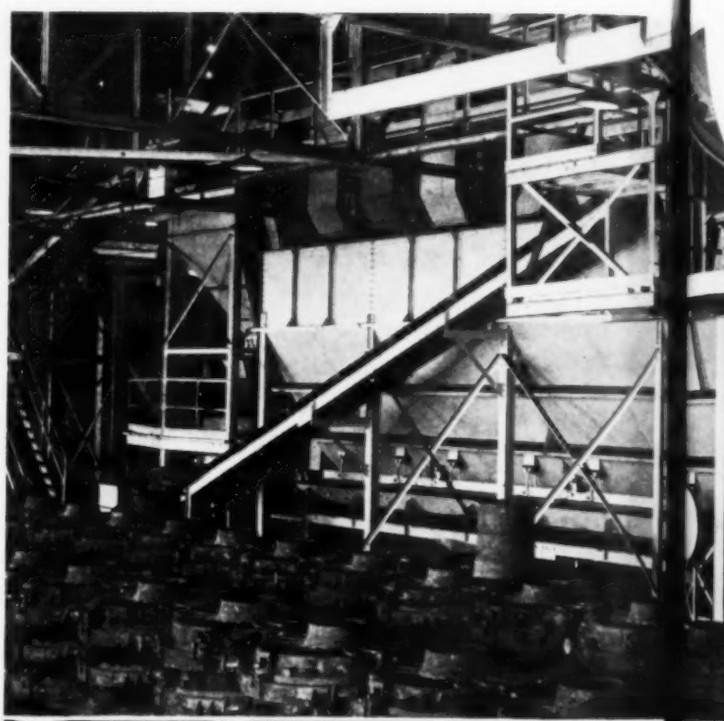


Fig. 1 (Above)—A pneumatic crane lifts the molds from the cars and shakes them out over an opening in the floor at the left. Fig. 2 (Right)—Flasks not immediately in use are available on a number of roller conveyors. Fig. 3 (Below)—Sand from the hopper in the center passes through a muller and thence by belt to the storage bins. Poured molds emerging from the cooling tunnel are shown at the left

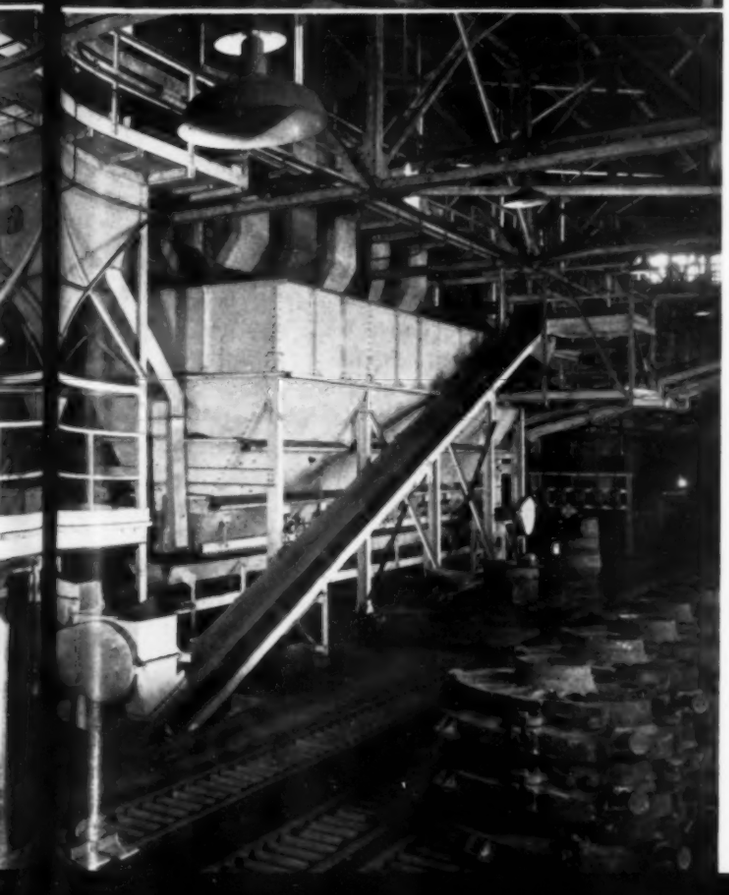
USE of chilled iron for railroad wheels in America dates back to the beginning of railroads. One manufacturer recently celebrated the one hundredth anniversary of continuous manufacture of chilled wheels for railroad service.

The chilled wheel today is the most popular type of wheel for steam railroad service and consequently used in greatest number. There are in service on American railroads approximately 8,500,000 single plate wheels and 8,500,000 double plate wheels. Manufacture of double plate wheels ceased in 1928.

Claim is advanced that the chilled wheel has maintained its supremacy for a century because it has properties more peculiarly adapted to service than any other type material, coupled with which the first and ultimate cost has been exceedingly low.

Outstanding growth of railroad transportation represents the magnitude of the work performed by wheels. The real beginning in the United States was in 1830 when the Baltimore & Ohio railroad opened for traffic a 14-mile double track line from Baltimore to Ellicotts Mills. This small beginning has increased until at the peak period of 1929 there were in the United States 249,100 miles of railroad main line with over 410,000 miles of track to which may be added 10 per cent to represent the total railroad mileage of the American continent.

Not only has there been a marvelous development in the carrying capacity of freight cars, but the rum-



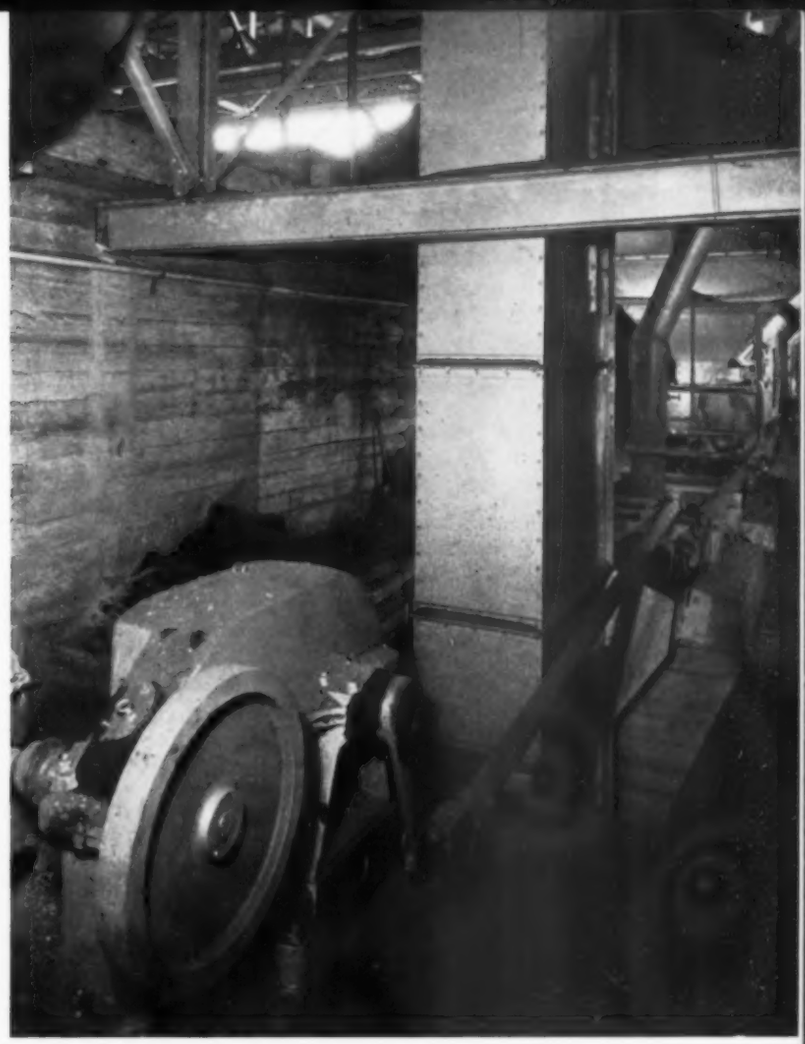


Fig. 4—Driving end of the reciprocal conveyor which carries the hot sand from the shakeout in a tunnel under the floor

ber of cars per train and the speeds at which they are operated represent an even greater advance. Speeds of freight trains following the Civil war may be judged from a magazine article written about 1912 under the heading "Rushing Freight to New York" which reported that the president of the Reading railroad 36 years prior to that time had said: "Eight miles to the hour is the proper speed. I will dismiss the engineer who dares to run by his mile post faster than that speed."

About the same time an eminent expert in transportation charged another great railroad company with reckless extravagance in running its freight trains as fast as 12 miles per hour. "The wear and tear is something terrible," he declared. "It is pounding the track to pieces. Every ton of freight hauled at that rate is carried at a loss. A reduction of speed to 8 miles per hour would lessen the expense in wear and tear on account of freight service on that railroad more than $1,000,000 per day."

Such were the ideas of the foremost men in charge of transportation in the days of iron rails, hand brakes, link and pin couplers, light wheels, jiggly light cars, etc.

Introduction of the air brake, automatic safety coupler, heavy rails, heavier chilled iron wheels, heavier and more rigid cars have permitted an era of rapid transit of heavy freight trains having daily schedules almost equal to that of (*Please turn to page* 68)

MELTING..... Copper Base Alloys

By N. K. B. PATCH

IN MELTING copper base alloys in which a small percentage of nickel is one of the desired components, the copper and nickel first are charged together. The nickel should be charged in the form of an alloy of nickel and copper, available on the market and commonly known as 50-50, which means 50 per cent copper, 50 per cent nickel. By using this type of nickel-copper addition, the temperature to which the copper is to be raised to dissolve the nickel, is materially reduced and consequently the danger of gas absorption by the bath also is reduced.

It should be remembered that any high copper alloy is hungry for underburnt gases and will absorb them readily, and practically there is no furnace atmosphere in which none of these gases exists. While it is possible to keep these gases at a minimum by having the general conditions on the oxidizing side, there are local points in the furnace where an insufficient supply of oxygen produces underburnt gases for the metal to absorb.

Consequently, to expose high copper alloys to furnace atmosphere any longer than necessary is foolish and dangerous. To require these alloys to be heated any hotter than necessary means additional time for this extra heating. Therefore it is most desirable to use any method that will reduce the time for reaching this extra high temperature necessary for the production of these alloys.

After the copper and nickel are molten, the additional elements, such as tin, lead and zinc are added. When the alloy contains zinc, some of the zinc should be added first to deoxidize the copper and thereby reduce any chemical effect of oygen in the copper upon other elements to be added. With no zinc in the alloy, it will be found desirable to add a deoxidizing agent in the form of a small percentage of phosphorus or manganese. The phosphorus is added in the form of phosphor copper and must be stirred in well. The manganese preferably is added in the form of cupro manganese, an alloy of copper and manganese, which regularly is sold on the market.

Some foundrymen think it desirable to use some form of a slag covering on these alloys. However, it is the author's opinion that such slag coverings are rather more expensive than appear on the face of it. Slags of an acid nature tend to react with the furnace lining and mean an increased cost for renewal of furnace linings where the charge is melted in open flame furnaces. If the charge is to be melted in the crucible, the acid slags tend to slag away the crucible and the crucible cost goes up.

Sulphur Comes from Slag

Some slags contain sulphur and result in some absorption of sulphur by the molten metal, causing trouble with defective castings. Some slags contain a lead compound, such as lead silicate. Where the casting alloy is supposed to be lead free, as in the instances of some of the phosphor bronzes, the bath picks up the lead from the slag, resulting in a distortion of analysis that logically might result in rejection by exacting inspectors.

Presence of the slag sometimes does prevent contact of the molten metal with improper furnace atmosphere, but in any case, the best practice is to correct the atmosphere. Furnace operators who are diligent about control of combustion conditions regularly produce the highest quality of metal in the phosphor bronzes and red brasses without the presence of slag coverings. (*Please turn to page* 74)

QUESTIONS and ANSWERS

Why Molding Sand Tends To Stick to Metal Patterns

What are the various factors to be checked in an effort to determine why molding sand sticks to brass, aluminum and iron patterns.

Among the many causes for sand sticking to the patterns may be included: Rough patterns, rusty patterns, open grain patterns, hot patterns and cold sand, hot sand and cold patterns, sand too wet, high clay content in sand. Open grain refers particularly to aluminum patterns and may be caused by the alloy itself or the temperature at which it is melted and poured.

In many instances sticking of sand to aluminum patterns may be prevented by spraying the patterns with kerosene oil in which a small quantity of tallow has been dissolved. Sand of the proper moisture and clay content and at a temperature to correspond to that of the pattern, will not stick to a clean, smooth metal pattern. To insure this clean smooth surface, brass and iron patterns usually are covered with a thin coating of pattern wax.

Wants Sand Mixture To Stand Up On High Ridges in Mold

We are making some gray iron castings weighing 150 pounds with deep grooves in the drag which have to be nailed. To obviate necessity of nailing we understand some foundrymen use a mixture of white sand, cereal binder and oil. We have tried this mixture, 1 wheelbarrow of white sand, 1 gallon of oil and 1 shovel of dextrine, but it is not satisfactory.

We are not familiar with the mixture to which you refer. Presumably the white sand is a fine silica sand, also known as silver sand, sugar sand and glass sand in various sections of the country. In other words a core sand. This sand has no bond and we fail to see how the addition of cereal and oil binder can supply the necessary bond to hold the sand ridges up in the green state. Also in the raw or unbaked state we should expect quite a boiling action where the molten iron comes into contact with the sand, especially in deep grooves or pockets where the body of sand is almost surrounded by the metal. Possibly this, or a somewhat similar mixture is used in certain foundries, but unless it is skin dried we cannot make ourselves believe that it will stand up. If the ridges are skin dried, the remainder of the face also must be dried. Unless prevented by certain features of which we are not aware, our suggestion would be put prints on the pattern and use regular dry sand cores to form the grooves.

Porosity Is Found in Bull Ring After Machining

We made four bull ring castings 36 inches inside diameter, 42 inches outside diameter and 13 inches high. Three guide rings 1-inch thick made in cores on the inside increased the thickness of the castings to 4 inches in these areas. The castings were gated at two diametrically opposite sides at the bottom, poured two up and gated tangentially so that metal from the two gates flowed in the same direction. We used no feeding risers. A rough machining cut revealed perfectly clean metal, but when the ring grooves were cut ¾-inch deep, several spongy areas were disclosed. The molds were made in good, open sand and vented properly. We are at a loss to account for these spongy areas.

From the description submitted we are inclined to the opinion that the spongy areas were caused by small masses of foreign material, combinations of slag and sand floating on the iron in the mold. Some of the sand washed from the sprues and gates and possibly from the wall of the mold or core near the bottom. This material floated part of the way up on iron that continually was getting more sluggish. Edges or tentacles from these pieces touched the wall of the core or mold, anchored the pieces there and the iron flowed past.

The best way to pour these rings is to build the core about 4 inches higher than the wall of the mold. Build a wide basin on the outside and pour the metal directly into the open mold. An attendant armed with a ¼-inch steel rod watches the rising iron, touches any accumulated foreign material and keeps it floating. While the metal is still liquid he pushes the rod to the bottom and moves it all around the ring to work any concealed material to the surface. The top of the casting is covered with dry sand or blacking and the inch or so of excess metal later is cut off in the machining operation.

Shows Spongy Place Near the Gate

We are sending for your inspection a yellow brass casting which shows a spongy condition near the gate. It was made from No. 1 yellow ingot with 2 ounces of aluminum per 100 pounds. The pattern consists of 12 pieces on a gate in a 12 x 18-inch flask. The gated pattern is arranged so that the metal backs into the mold. About 50 per cent of the castings are rejected on account of this spongy condition.

Examination of the casting which is shaped like the letter L, and about ⅛-inch thick, indicates that the so-called spongy area in the vicinity of the gate is the result of small inclusions of aluminum oxide being folded in at that point. The only way that trouble can be eliminated is to leave out the aluminum additions to the metal, or change the gating method so that the molten metal enters the cavity without any spurting or turbulence.

Standard No. 1 yellow brass ingots contain approximately 66 per cent copper, 1 per cent tin, 3 per cent lead, and 30 per cent zinc. With a little care it is possible to pour that composition without addition of aluminum. Addition of aluminum aids in reducing the quantity of zinc fumes, and appears to make the metal more fluid. However, the aluminum forms a skin of aluminum oxide on the metal, and care must be taken not to break that skin since the broken particles form inclusions which are folded into the metal.

Make Diesel Engine Cylinder Liners

We are making diesel engine cylinder liners which are 54 inches long, 14 inches inside diameter, and 18 inches outside diameter. They are cast on end in dry sand, and the analysis shows 1.15 per cent silicon, 0.067 per cent sulphur, 0.18 per cent phosphorus, 0.80 per cent manganese, 0.65 per cent nickel, 0.25 per cent chromium, 0.25 per cent molybdenum, and 3.14 per cent total carbon. We have kept them as hard as possible, but still machinable, and they show a fine close grain. We have no hardness data and we would like to know if you have any suggestions relative to hardness, analysis, heat treatment, etc. At present we rough turn, normalize at 700 degrees Fahr., cool finish turn, and grind bore.

Since you do not have any information on the hardness of your present castings, it is suggested that equipment be purchased to perform that test as you will find ample use for such an instrument. If that cannot be done, then have the tests performed by some commercial testing laboratory. Without such information, it will be difficult to determine whether or not you obtain any improvement by changes in composition, etc.

We note that at the end of your inquiry that you mention normalizing at 700 degrees Fahr. presumably to relieve any casting strains, and in our opinion little benefit will be obtained by that practice unless the castings are subjected to that temperature for an extremely long period. Raise the temperature to between 900 and 1000 degrees Fahr., and maintain the castings at that heat for 2 hours, and cool slowly, preferably in the furnace.

As far as your present analysis is concerned, we believe that it is satisfactory although some improvement may be obtained by increasing the nickel content to about 1 per cent or slightly over. To give you some idea of the variety of compositions employed for similar castings the following are noted: Silicon, 1.40 to 1.50 per cent; phosphorus, 0.15 to 0.25 per cent; manganese, 0.80 to 1.00 per cent; nickel, 0.20 per cent; chromium, 0.50 to 0.60 per cent; titanium, 0.07 to 0.08 per cent, and total carbon, 3.40 to 3.60 per cent. Brinell hardness on castings ranges from 180 to 200. Another contains 1.55 to 1.70 per cent silicon; 0.10 to 0.15 per cent phosphorus; 0.75 to 0.90 per cent manganese; 0.10 per cent nickel; 0.40 to 0.45 per cent molybdenum; 0.07 to 0.08 per cent titanium, and 3.15 to 3.30 per cent total carbon. Brinell hardness ranges from 223 to 229.

A third composition contains 0.90 to 1.10 per cent silicon; 0.15 to 0.20 per cent phosphorus; 0.60 to 0.80 per cent manganese; 1.00 to 1.50 per cent nickel; 0.25 to 0.50 per cent chromium, and 2.80 to 3.10 per cent total carbon. Brinell hardness is from 190 to 220. A fourth shows 1.25 to 1.40 per cent silicon; 0.10 to 0.20 per cent phosphorus; 0.60 to 0.80 per cent manganese; 1.00 to 1.25 per cent nickel; 0.25 to 0.35 per cent molybdenum; 0.20 to 0.30 per cent chromium, and 2.80 to 3.10 per cent total carbon. Brinell hardness ranges from 190 to 220.

Soldering Aluminum Pattern Plates

Can you give us any information on soldering cast aluminum alloy pattern plates with an ordinary, heavy soldering iron? Occasionally, we have to build up metal pattern plates, but cannot seem to be able to get the solder to stick. What flux should we use so that the aluminum solder will make a strong connection with the metal?

Due to the characteristic oxide film which forms on aluminum and its alloys, difficulty usually is encountered in soldering. Molten solder will not wet or alloy with aluminum which is covered with oxide. Use of soldering fluxes generally is not recommended because the few which are effective, are difficult to remove, and are likely to leave inclusions in the soldered joint which later may accelerate corrosion.

The most generally useful method is to abrade the surface of the aluminum under a film of molten solder so that the solder can wet the freshly exposed surface before it comes in contact with the air, and acquires an oxide film. Procedure is to clean the surfaces to be soldered and heat then slightly above the melting point of the solder. Since aluminum is a good conductor of heat, a considerable quantity of heat will have to be applied to the spot which is to be soldered to get it hot enough to melt the solder. That is necessary because the heat rapidly is conducted to other parts of the work.

When a small amount of the solder has been melted on the surface, the solder is rubbed or worked with a wire brush. That operation abrades the surface underneath, removing the oxide, and exposing a clean metallic surface which can be wetted by the solder. If your soldering iron is heavy enough to supply the required amount of heat, we can see no reason why you cannot solder successfully, provided you keep in mind the previously mentioned points. Otherwise, you will find that use of a blowtorch will save you much time and trouble.

Gives Procedure for Mixing Alloy

A customer of ours has requested an alloy which is to contain 40 to 50 per cent copper, 10 to 15 per cent nickel, 30 to 40 per cent zinc, 1 to 2 per cent iron, 1 to 2 per cent manganese, and ½ to 1½ per cent chromium. We would like to know if it is common foundry practice to melt the copper and nickel first, and then immerse the zinc in small quantities by holding each piece, about 10 pounds for instance, under the slug in the molten mass until 30 to 40 per cent is introduced?

So far as we know, the common procedure in making alloys containing zinc, is to add the zinc last just a short time before the metal is taken from the furnace. Zinc volatilizes at a comparatively low temperature as compared to copper for example, and if it were added at the beginning of the heat, a large portion of it would disappear by the time the copper was melted.

The alloy you mention is not a common one, and appears to be a nickel silver with some iron, man-

ganese and chromium replacing part of the nickel. In making the alloy we believed that your procedure should be to melt the copper and nickel together, and then add the chromium, manganese and iron. Presumably you will employ ferromanganese and ferrochromium and since those both contain iron, less of that material will have to be added as metallic iron. The zinc of course is added last as previously mentioned, and then only shortly before pouring. Since the temperature of the molten metal will be high, you will not have much difficulty in dissolving the zinc.

Use Alloy Iron for Permanent Molds

We are interested in securing information on permanent molds for aluminum castings, and will appreciate any help you can give us.

Permanent molds for aluminum castings usually are made of dense, close-grain gray iron which is resistant to thermal shock. One type which gives satisfactory results contains about 1.50 per cent nickel and 0.60 per cent chromium. Others suggested contain 1.50 per cent copper and 0.10 per cent vanadium, or 0.50 per cent chromium and 0.10 per cent vanadium while a third type contains from 0.30 to 0.80 per cent molybdenum.

Design of molds requires skill and experience, and the molds should be designed so that there is little difference in temperature between the hotter and cooler portions of the molds to eliminate warpage and cracking. Location of gates should be such that the molten metal enters the cavity without spurting, splashing or turbulence. The gates should be large enough to insure filling the mold rapidly. Risers if required, should be attached to the casting with an opening that will remain open until the casting has solidified. Sometimes vents must be provided to prevent pocketing of air within the cavity. Those vents are narrow channels cut in the mold joints, and are large enough to allow gases to escape, but small enough to prevent any substantial flow of metal into them.

Mold faces usually are given a thin coating of whitewash to prevent sticking of castings. However, where chilling is desired the coating is left off, and in cases where extremely rapid chilling is desired, copper plugs are inserted into the mold to provide a more rapid dissipation of heat. Cores may be of steel or sand, and choice of material will depend upon their shape, and whether or not they can be withdrawn from the casting after solidification. Usually before beginning production, the mold must be raised to the proper operating temperature by pouring a few waster castings, or heating with gas flames. With some types of castings it may be necessary to provide additional heat continuously to the molds by gas flames. Pouring temperatures should be controlled carefully to obtain sound castings with the best physical properties.

Small Area Chilled On Casting Face

We are forwarding for your inspection a piece of a small gray iron casting 1¼-inches thick with a hard spot showing on the machined face. We poured 18 of these castings from the same heat and while 16 were perfect, two showed this defect. All other castings from the same heat also were perfect.

The cause may be metallurgical. Patches similar and even more pronounced as to chill appear occasionally in semisteel mixtures where the metal has not been melted at a sufficiently high temperature. However, in the present instance we are inclined to the opinion that the defect was caused either by a piece of scrap metal in the mold close to the surface, or a wet or hard patch in the sand. Judging solely by the appearance of the fracture and the high polish on the machined surface, the metal is a semisteel mixture with silicon content close to the chilling range. That is to say the composition is so close to the dividing line that an ordinarily trifling factor is sufficient to impart a chill to a local area.

Wants Information On Bosh Plates

We are considering the production of bosh plates or cooling plates for a blast furnace. The castings 3 x 14 x 18 inches are cored to a thickness of 1 inch and are to be made from pure copper. The cores are to be supported without chaplets and the only place for the gas to escape is through two or three 1-inch diameter holes in one end for water pipe connection. We shall appreciate information on how the core is held in place, also why does the customer insist on pure copper.

Answering the second question first, the bosh plates are made of copper because copper has high heat conductivity, but principally because copper will not crack as readily as cast iron and permit the cooling water to leak through. Usually the customer supplies the scrap castings and these are incorporated in the charge in varying amounts from 30 to 100 per cent. Approximately ¼-pound 15 per cent phosphor copper or phosphor tin is added to each 100 pounds of metal in the crucible before the casting is poured.

Instead of being molded flat, the casting is molded on end with the core prints either in the cope or in the drag. A piece of ½ or ⅝-inch perforated pipe threaded at one end is placed in each core print in the core. The pipe extends almost the full length of the core and projects for several inches beyond the print. When the core is placed in the mold the threaded end projects through a hole in an iron bar in the cope or drag. A nut and washer anchors it securely in place. The casting may be gated at the top or bottom, preferably on top through a number of small pencil gates supplied with metal from a basin on top of the cope. Preferably the molds should be dried, but with an open, permeable sand worked as dry as possible, the molds can be made in green sand.

Has Trouble With Slight Leaks

In the production of one of our castings which has to withstand a cold water pressure of 60 pounds per square inch, we have considerable difficulty with slight leaks through small porous spots evidently caused by gas. These are inaccessible for stopping unless there is some solution available which can be forced through to form a seal. Can you tell us whether anything suitable can be obtained?

It seems to us since your trouble is confined to one type of casting, that it would be well worthwhile to make a careful investigation of the various factors entering into the production of the casting, and eliminate the cause rather than to attempt to doctor it. Examine the method of gating and of risering to see that they function properly. See that your cores are permeable, and are vented to the outside of the mold.

Possibly some of the castings might be reclaimed by forcing through under pressure, a strong solution of sal ammoniac (ammonium chloride), and then permitting them to dry thoroughly in the air. The sal ammoniac solution reacts with the iron to form iron chloride which later is oxidized by the air to form iron oxide or rust. The oxide remains in the porous sections, and in many cases prevents further leakage.

Another possibility is to employ a synthetic resin in liquid form which also is forced through under pressure. After allowing the surplus liquid to drain off, the castings are baked at a low temperature to set or solidify the resin.

Otto Nadolny

Alfred Walcher

W. H. Doerfner

Ray Crosby

MEN of INDUSTRY

ALFRED WALCHER, vice president, American Steel Foundries, Chicago, was elected a director of the American Foundrymen's association at the recent annual meeting of the board of directors. Mr. Walcher was born Aug. 7, 1879. He began his connection with the American Steel Foundries in 1902 and was successively pattern foreman from 1902 to 1904; works manager, Granite City works, from 1904 to 1916; engaged in the production of shell forgings at the Indiana Harbor works from 1916 to 1919; assistant vice president in charge of steel foundry operations from 1919 to 1929 and vice president since the latter date.

♦ ♦ ♦

W. H. DOERFNER, general manager, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich., was elected a director of the American Foundrymen's association at the recent annual meeting of the board of directors. Mr. Doerfner joined the Saginaw Malleable Iron Co. in 1918 as timekeeper and except for the period from 1924 to 1928 when he was constructing a foundry for the Harrison Radiator division in Lockport, N. Y., he has continued with the same division. After extensive experience in the shops he was made general superintendent, and in 1928 became works manager. He was made general manager recently as announced in THE FOUNDRY for May, 1938.

♦ ♦ ♦

OTTO NADOLNY, manager, Duquesne Pattern & Bronze Co., Pittsburgh, recently was elected president of the Pittsburgh Foundrymen's association. Mr. Nadolny was born in Pittsburgh in 1890 and received his education and training in that city. He then was connected with the Jones & Laughlin Steel Corp., Westinghouse Electric & Mfg. Co., Mackintosh-Hemphill Co., all of Pittsburgh and the John Engles Foundry & Machine Co., Toronto, Ont. In 1917 Mr. Nadolny established what is now the Duquesne Pattern & Bronze company, specializing in pattern and nonferrous castings. He has been president of the Pittsburgh Pattern Manufacturers association for the past 10 years.

♦ ♦ ♦

RAY CROSBY recently has become connected with the Smith Facing & Supply Co., Cleveland, as assistant to the vice president and general manager, RAY FLEIG. Mr. Crosby was graduated from Purdue University in 1917 in chemical engineering and then joined the Aluminum Castings Co., Detroit, now the Aluminum Co. of America, as chemist. A short time later he was transferred to the Buffalo plant of that organization as technical foreman. In January, 1918, he was transferred to the Cleveland plant where he supervised control of metal for Liberty motor castings and other war materials. The latter part of 1918 he was transferred to the new Harvard avenue plant of that company where he had charge of the control of metals. In 1922 he was made assistant manager of the piston plant. Two years later he resigned to become manager of the Aralite Co., a subsidiary of the Allyne Ryan Foundry Co. organized to manufacture aluminum pistons. Four years later when that plant was sold, Mr. Crosby was transferred to Allyne Ryan Foundry Co., producer of gray iron castings, where he has worked in various capacities for the past 10 years.

♦ ♦ ♦

ROBERT E. BROWN, Pittsburgh, has been appointed sales representative of the Ohio Electric Mfg. Co., Cleveland, in the Pittsburgh area.

♦ ♦ ♦

ALAN A. GARLAND has been appointed general purchasing agent, Standard Sanitary Mfg. Co., Pittsburgh, to succeed the late George J. Black.

♦ ♦ ♦

ALEXANDER HAIGH, 141 Milk street, Boston, has been made representative of the Hammond Machinery Builders Inc., Kalamazoo, Mich., in the New England states.

♦ ♦ ♦

C. RAYMOND MESSINGER, president, Chain Belt Co., Milwaukee, and chairman of the board, Oliver Farm Equipment Co., Chicago, has been elected a member of the Yale university alumni board.

♦ ♦ ♦

JOSEPH D. FREEMAN, superintendent, Southern division, American Brake Shoe & Foundry Co., New York, has been made superintendent of the company's Pittsburgh plant. J. B. CONNER, Toledo, O., has been made superintendent of the Sayre plant.

♦ ♦ ♦

LUDWIG EMDE has been appointed Detroit district sales manager, Worthington Pump & Machinery Corp., Harrison, N. J. Mr. Emde has been a member of the Worthington organization since his graduation from the University of Michigan in 1930.

(*Continued on page* 40)

1% NICKEL *made 'em...*

FOUNDRY FOREMAN quit cussing when 1% Nickel increased fluidity and promoted better casting qualities from heat to heat.

BOSS started smiling when rejects stopped eating profits – no foundryman ever gets rich on rejects. Nickel added to bronze assures pressure tightness, increases tensile and compression strength, adds hardness with little or no loss in ductility: simplifies machining.

CUSTOMER relaxed when these Nickel bronze castings for locomotive boiler feed pumps withstood required pressure tests—and were sound and dense throughout.

CONSULTING ENGINEER beamed when finished Nickel bronze castings held pressures and, despite high temperatures, "proved satisfactory in every way."

PRESSURE-TIGHT CASTINGS

These locomotive boiler feed pump castings were produced of a Nickel bronze composition:

COPPER	85%
ZINC	5%
LEAD	5%
TIN	4%
NICKEL	1%

Castings by Textile Machine Co., Reading, Pa., for J. S. Coffin Jr. Co., Englewood, N. J. E. L. Schellans, Consulting Engineer.

CAST
NICKEL
BRONZES

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

(*Continued from page* 38)

SAMUEL APPELBY recently was appointed foundry superintendent, Buffalo Foundry & Machine Co., Buffalo. Mr. Appelby was born in Rochester, N. Y., and graduated from East high school in that city in 1912. Shortly after leaving school he entered the foundry of the American Woodworking Machinery Co., Rochester, where he remained for 10 years, acting as foundry manager from 1920 to 1923. In 1923 he accepted a position as assistant foundry superintendent, McIntosh & Seymour Corp., Auburn, N. Y., and remained with that company and its successor, the American Locomotive Co., Schenectady, N. Y., until 1936. He has also worked with the Pratt & Letchworth Co., Buffalo, as foundry foreman, and with the Producto Machine Co., Bridgeport, Conn., as foundry superintendent. Mr. Appelby is a member of the American Foundrymen's association.

♦ ♦ ♦

GUS CARL recently became connected with the Excel Brass & Aluminum Foundry, Pekin, Ill. Mr. Carl has had more than 25 years experience in the foundry industry in both the United States and Germany. He worked for many years in one of Germany's largest foundries where green, dry sand and loam castings were produced. He also served as a molder and coremaker in the Krupp foundries, Germany. Since coming to the United States in 1925, Mr. Carl has been employed by the Falcon Bronze Co., Youngstown, O., and the Superior Bronze & Aluminum Co., Warren, O. Since 1932, he has been employed by the Oakes Bronze & Aluminum Co., Warren, O.

♦ ♦ ♦

JAMES SUTTIE has been named general manager in charge of sales and production, industrial division, American Steel Foundries, Chicago. Mr. Suttie came to this country from Scotland in 1911 and immediately began working for American Steel Foundries in its Chicago office. He was transferred to Indiana Harbor works, East Chicago, Ind., in 1915, and became manager of the Indiana Harbor works in 1929. He held that position until his recent appointment. Mr. Suttie is a member of the Steel Founders Society of America, the American Foundrymen's association, and Army Ordnance association.

♦ ♦ ♦

RICHARD S. SHUTT has been appointed supervisor of chemical research, Battelle Memorial institute, Columbus, O. Dr. Shutt is a graduate of Kenyon colleye and holds advanced degrees from Ohio State university. He was previously employed by Sherwin-Williams Co., and for several years was research chemist with E. I. du Pont de Nemours & Co., Wilmington, Del. Recently he occupied a research position with American Cyanimid & Chemical Co.

♦ ♦ ♦

WILLIAM W. BOND has been appointed western sales manager of the positive drive division, Link-Belt Co., Chicago, with headquarters in Indianapolis. Mr. Bond has been in the company's employ since 1911, first serving in the engineering department of the Philadelphia plant.

♦ ♦ ♦

L. M. VILES, for more than 20 years president, Buda Co., Harvey, Ill., has been elected chairman of the board. J. S. DEMPSEY, formerly secretary-treasurer, succeeds Mr. Viles as president, while F. E. PLACE has retired as senior vice president. The executive committee is comprised of Mr. Dempsey and two operating vice presidents, R. K. MANGAN and E. D. CONANT.

♦ ♦ ♦

COLLINS L. CARTER, vice president, Albion Malleable Iron Co., Albion, Mich., has been elected president of that company. Other new officers include: Chairman of the board, RAYMOND H. GARDNER, formerly executive vice president; vice president in charge of production, ALVIN DICE; and vice president, THOMAS J. LLOYD. M. B. MURRAY continues as secretary and member of the board.

Mr. Carter, who was educated at the Culver Military academy and Cornell university, has been associated with the Albion Malleable Iron Co. for more than 10 years. He has served as salesman, sales manager, and general manager.

♦ ♦ ♦

PRESCOTT B. JENSEN, metallurgist for the Fort Wayne, Ind., works of the International Harvester Co., Chicago, has been transferred to the new Indianapolis engine plant as heard of the metallurgical department. HENRY E. ELFNER has been sent to Indianapolis as resident engineer; GUY A. BAKER, engine inspector, will serve as assistant resident engineer, and RUDOLPH T. RUDOLPHSON, assistant chief inspector, has been transferred to Indianapolis in the same capacity. SPERRY A. FRY, former head of the salvage department of the Fort Wayne plant, succeeds Mr. Rudolphson.

♦ ♦ ♦

KARL G. JANSSON, works manager, Keokuk Steel Casting Co., Keokuk, Iowa, has been advanced to vice president, succeeding the late Walter O. Parham. JOHN SONNENFELT has been made works manager of the company. Mr. Jansson first was employed by the Indiana Harbor plant of the American Steel Foundries, and later became works manager of the Ohio Steel Foundry's plant in Springfield, O. He resigned that position to become interested in the Lima Metals Foundry Co., Lima, O. Later he returned to the steel casting business as foundry manager of the Twin Forge & Foundry Co., Stillwater, Minn., where he remained until he accepted a position with the American Steel Foundries

(*Concluded on page* 42)

Samuel Appelby

Gus Carl

James Suttie

Richard S. Shutt

GETS PREFERENCE WITH CRITICAL BUYERS

PENOLYN CORE OIL PRAISED THROUGHOUT FOUNDRY INDUSTRY

UNIFORMITY WINS WIDE ACCEPTANCE

CAST IRON, steel, malleable, aluminum, brass and other non-ferrous foundry men have found in Penolyn consistent uniformity in all the characteristics required of a good core oil. The sweeping success of Penolyn is based on much more than such usual claims as better workability, greater binding strength, minimum gas and faster cleanout. UNIFORMITY . . . FEWER REJECTS . . . BETTER CASTINGS . . . all are assured through the use of Penolyn Core Oil. Penolyn will successfully meet your requirements no matter how exacting or variable. Penola's foundry engineers stand ready to recommend the exact grade of Penolyn needed in any given foundry practice to produce "that perfect casting." For real economy, try Penolyn. See why it is the first choice of critical buyers in all parts of the country.

PENOLA INC.

PITTSBURGH, PA. (Formerly Pennsylvania Lubricating Co.)
NEW YORK • CHICAGO • DETROIT • ST. LOUIS

(*Concluded from page* 40)

as superintendent of their Pittsburgh plant. In February, 1936, he joined the Keokuk Steel Casting Co. as works manager.

Mr. Sonnenfelt first was employed as chemist and metallurgist, and later as superintendent, by a steel foundry of LaBrugeoisc, Belgium. Leaving that company, he came to the United States to take charge of the Reed Foundry & Machine Co., Kalamazoo, Mich. He later joined the Lima Steel Casting Co., Lima, O., and in 1919 took charge of the Mathews Steel Casting Co., Cleveland. He later became superintendent of the Reading Steel Casting Co., Reading, Pa., before joining the Dayton Steel Foundry Co., Dayton, O. He left this company to accept his new position with Keokuk Steel Casting Co.

♦ ♦ ♦

J. C. BARNABY, former manager of Worthington Pump & Machinery Corp. Oil and Gas Engine Application division, Buffalo, N. Y., and responsible for engine sales in the Central division, is being placed in charge of special engineering work covering engine research and design, and will devote his entire time to this activity. W. E. WECHTER, in charge at New York of the corporation's engine sales in the Atlantic division, has been transferred to Buffalo to succeed Mr. Barnaby. He will be assisted by J. F. HECKING, who continues as assistant manager of the Oil and Gas Engine Application division. In the Atlantic division, oil engine sales will be covered by H. C. WOOD at New York, while W. L. RUSSELL, at Harrison, N. J., will take over the gas engine sales. Mr. Russell also will remain manager of the Eastern division of oil and gas power sales.

♦ ♦ ♦

DONALD C. BAKEWELL has been elected a director of the Blaw-Knox Co., Pittsburgh. Mr. Bakewell became affiliated with that company early in 1937, being engaged in a sales capacity, and was elected a vice president in June, 1937. He graduated from Yale with the class of 1908 and took post graduate training at the Massachusetts Institute of Technology. Mr. Bakewell for many years was president, Duquesne Steel Foundry division, Continental Roll & Steel Foundry Co., Coraopolis, Pa. Before joining the Blaw-Knox Co. he was first vice president of a western roll and machine company. He has served as a member of the steel division advisory committee of the American Foundrymen's association and the executive committee of the Steel Founders' Society of America.

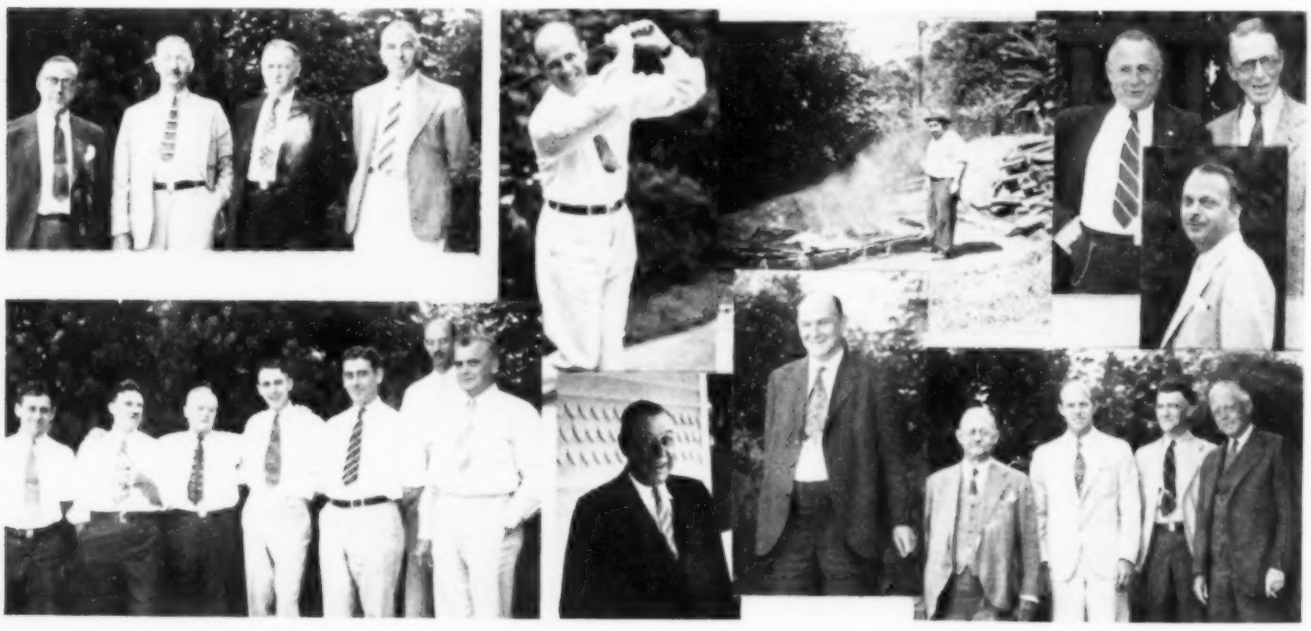
Donald C. Bakewell

Book Review

Steels for the User, by R. T. Rolfe, chief metallurgist W. H. Allen, Sons & Co. Ltd., Bedford, England; cloth; 280 pages 5 x 8 inches; published by Chemical Publishing Co., of New York, Inc., New York and supplied by THE FOUNDRY, Cleveland, for $8.50 and in Europe by the Penton. Publishing Co., Ltd., London.

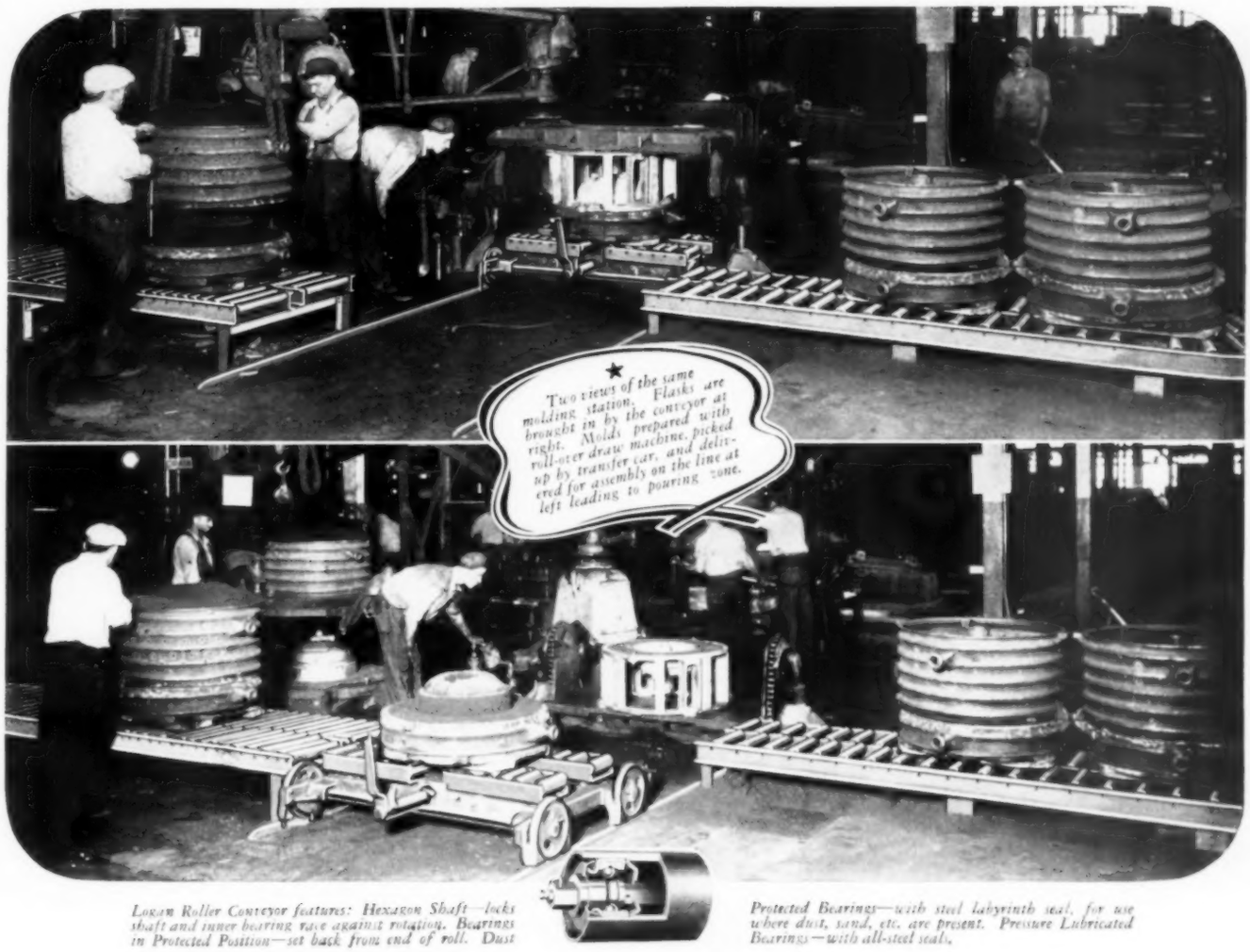
The book is a practical one scientifically explained rather than a theoretical one with practical examples. Practice is paramount throughout, but no doubt is left in the mind of the user as to precisely what is happening and why. Mechanical tests are dealt with. Requirements of specifications are listed comparatively and discussed in the light of a large number of tests resulting from practice. Compositions, heat treatments and other methods for obtaining materials of suitable quality are treated.

Scope of the work may be gathered from the following chapter headings: Mechanical quality and its assessment; Special requirements for commercial steels; Effect of composition upon mechanical quality: Bright and free cutting steels; Heat treatment of steel; Theoretical considerations; Industrial heat treatment of low carbon steels; Heat treatment of high carbon steels; Case hardening and similar treatments; Use of steels at elevated temperatures; Fatigue testing; General principles of selection.



While the clambake was the main feature of the outing of the New England Foundrymen's association, a golf tournament and other sports were enjoyed by the members. Illustrations through the courtesy of C. A. Wyatt, Debevoise-Anderson Co., Boston

Conveyors
ARE PART OF THE PROCESS



Two views of the same molding station. Flasks are brought in by the conveyor at right. Molds prepared with roll-over draw machine, picked up by transfer car, and delivered for assembly on the line at left leading to pouring zone.

Logan Roller Conveyor features: Hexagon Shaft—locks shaft and inner bearing race against rotation. Bearings in Protected Position—set back from end of roll. Dust Protected Bearings—with steel labyrinth seal, for use where dust, sand, etc. are present. Pressure Lubricated Bearings—with all-steel seals.

Handling equipment is production equipment

IN FOUNDRIES—it's *handling* all the way! Not only at molding stations, as shown above, but all down the line of pouring, shakeout, and machining, conveyors are an integral part of the modern foundry process.

Savings in time, effort, space, and accurate scheduling are but some of the contributions of Logan Conveyors to lower-cost foundry production.

If your plant has not made use of every productive conveyor application you will be pleased of course to discover further possibilities. That's why we suggest "Call the nearest Logan engineer" or write on your letterhead for Bulletin 15. No obligation in either case. *Now* is planning time!

LOGAN CO., Incorporated,
580 Buchanan Street,
Louisville, Ky.

MOVING IS 90% OF MAKING

Logan Conveyors
LOUISVILLE

C. E. Hoyt

R. E. Kennedy

N. F. Hindle

E. O. Jones

A.F.A. Makes Staff Changes

SEVERAL changes in the organization of the American Foundrymen's association were made at a meeting of the board of directors held July 26, as reported briefly in the August issue of THE FOUNDRY. C. E. Hoyt was re-elected executive vice president; Robert E. Kennedy formerly technical secretary was elected secretary; E. O. Jones, director of safety and hygiene division was made treasurer and will continue as director of that division; Norman F. Hindle formerly assistant technical secretary was elected technical secretary; and Miss Jennie Reininga was re-elected assistant secretary-treasurer. All are well known to the foundry industry through varying years of service in the work of the American Foundrymen's association.

Charles E. Hoyt

CHARLES E. HOYT comes from a family of foundrymen, his father and his three uncles having learned the trade in the days when a 7-year apprenticeship was required. During vacations he worked in the foundry, and after finishing school was associated with his father in operating a jobbing and machine shop. Then he accepted a position with Michigan State college, East Lansing, Mich., in charge of pattern shop and foundry work. He remained at the college for 3½ years, until he resigned to accept a somewhat similar post on the engineering faculty of Lewis institute, Chicago.

In Chicago Mr. Hoyt took an active part in association work as a member of the Western Foundrymen's association and as secretary-treasurer of the Chicago Foundry Foremen's association. As secretary of the Chicago association, Mr. Hoyt staged two conventions and exhibits at the Lewis institute which attracted the attention of the Foundry Supply association, which later elected him secretary and manager of exhibits. Later he occupied the same position with the succeeding organization, the Foundry and Machine Exhibition Co.

When the American Foundrymen's association was incorporated in 1916, Mr. Hoyt was elected director and manager of exhibits. When the association established a war service office in 1917 in Washington at the request of the government, Mr. Hoyt resigned the post on the faculty of the Lewis institute and accepted the position of secretary-treasurer of the American Foundrymen's association. In 1926 he was made executive secretary-treasurer and held that position until his election in 1936 to the post of executive vice president.

Miss Jennie Reininga

Robert E. Kennedy

ROBERT E. KENNEDY was born in Vincennes, Ind., in 1887 and was graduated in 1909 from the Winona Technical institute, Winona Lake, Ind., and later from the University of Illinois, Urbana, Ill. From 1910 to 1917 he was instructor in foundry practice at the University of Illinois, and from 1919 to 1921 he was assistant professor in charge of foundry practice. During the summer vacations at the university he was engaged in foundry work in the following plants: 1911, chemist, Mitchell Motor Car Co., Racine, Wis.; 1912, molder, Rumley Oil Pull Tractor Co., Laporte, Ind.; 1913, coremaker, Stover Gas Engine Works, Freeport, Ill.; 1914, molder, Central Foundry Co., Vincennes, Ind.; 1915-1916, time study work, Packard Motor Car Co., Detroit; 1917, assistant foundry superintendent, Dunham Co., Berea, O.; and in 1920, mechanical methods engineer, Hawthorne works, foundry department, Western Electric Co., Chicago.

During the war he spent a period in the steel foundry at the Watertown, Mass., arsenal. After his discharge from the army in 1919, he was appointed assistant superintendent of the United States training service, foundry training, department of labor, and prepared United States training service bulletin No. 24 "Industrial Training for Foundry Workers." On completion of this work he returned to the University of Illinois as superintendent of the foundry.

Mr. Kennedy was appointed assist-

(*Concluded on page* 47)

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(*Concluded from page* 44)

ant secretary of the American Foundrymen's association in 1921. Recently he has held the position of technical secretary of the association. He is a member of the Society of Mechanical Engineers and an associate member of the American Institute of Mining and Metallurgical Engineers.

Ellsworth O. Jones

ELLSWORTH O. JONES was born in Racine, Wis., in 1893, and was educated in the public schools of that city. He then became associated with the Industrial Crushed Stone Co., Racine, and remained with that organization for 2 years. He later became an apprentice with the J. I. Case Co., Racine, advancing through various positions and serving continuously until 1922, except for a 2-year period during which he was overseas with the 121st heavy field artillery.

In 1922 Mr. Jones accepted the position of purchasing agent, Belle City Malleable Iron Co., Racine, and held that position until 1934 when he became consultant for the industrial relations bureau, National Founders' association. In 1936 he was made director of the safety and hygiene section of A. F. A.

Norman F. Hindle

NORMAN F. HINDLE was born in Fort Wayne, Ind., in 1902, was educated in the schools of that city, and was graduated in 1925 from Purdue university, Lafayette, Ind. Mr. Hindle entered the employ of American Steel Foundries, at the Alliance, O., plant as a laboratory chemist. In 1926 he was made chief chemist of the company's Indiana Harbor plant, and remained in that position until 1928 when he resigned to accept a position with THE FOUNDRY, Cleveland, as assistant editor. He later returned to the American Steel Foundries and remained with that company until he joined the executive staff of the American Foundrymen's association as assistant technical secretary.

Miss Jennie Reininga

MISS JENNIE REININGA first became connected with the foundry exhibition activities in 1911 when she accepted the position as assistant to Charles E. Hoyt, secretary of the Foundry and Machine Exhibition Co. The Exhibition company was at that time the organization in charge of the foundry shows which were held in connection with annual convention of the American Foundrymen's association.

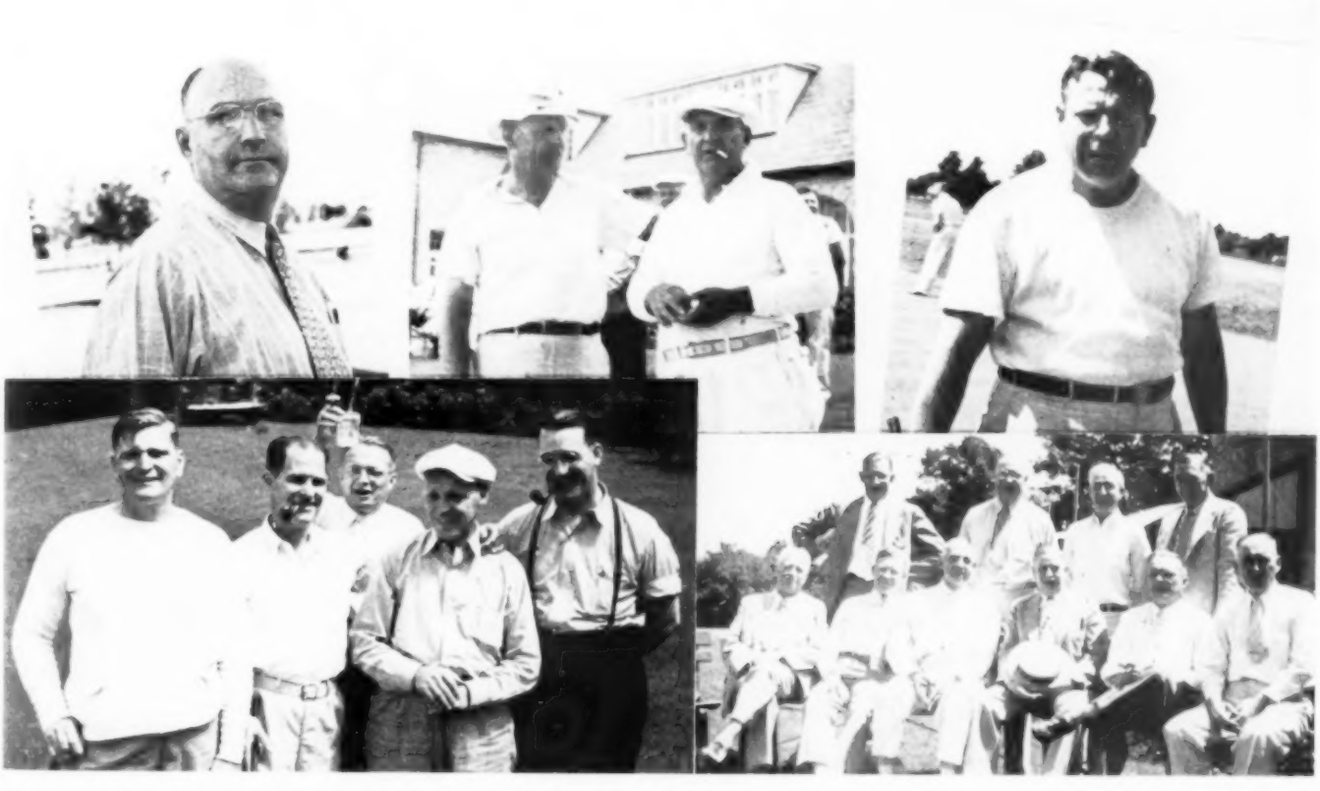
When, in 1918, the A.F.A. took over the foundry exhibit, Miss Reininga was employed in the association as assistant to Mr. Hoyt who was elected secretary-treausrer and manager of exhibits of the A.F.A. Then in 1929 she was formally elected assistant secretary-treasurer, a position which she has since held and made of major importance in the operation of A.F.A. office affairs.

Miss Reininga was born in Chicago, her parents coming to this country from The Netherlands. She obtained her formal education in the public schools and West Division high school, Chicago. For several years she has made her home in Oak Park, Ill.

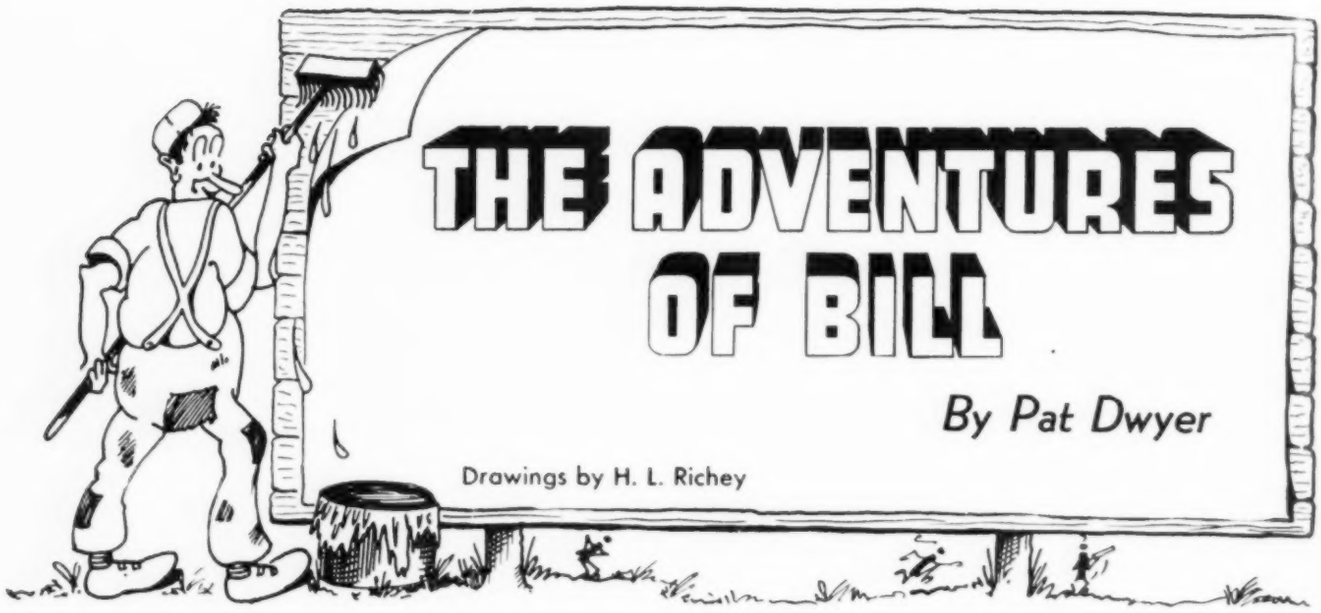
Publishes Bulletin

British Nonferrous Metals Research association, London, England, has published a 36-page bulletin which is entitled "Nickel Silver—A Survey of Published Information", by T. F. Pearson. The bulletin, which is in the form of a report of the association, discusses both wrought and cast alloys. Specifications and mechanical and physical properties are considered as well as aspects of melting and casting. Some casting defects are mentioned and sands and sand molding are touched upon briefly. Effects of impurities on behavior in casting and working, and on properties are described as well as information on rolling, extruding, jointing, cleaning and finishing.

Broderick & Bascom Rope Co., 4203 North Union boulevard, St. Louis, has purchased the business of the Murray Safety Sling Co., Pittsburgh. The Murray Safety Sling division will be operated at 33 Water street, Pittsburgh, under the direction of D. Murray.



Members and guests of the Wisconsin chapter of the American Foundrymen's association held an outing at which a golf tournament was one of the main features. Illustrations are through the courtesy of Walter Gerlinger, Walter Gerlinger, Inc., Milwaukee



THE ADVENTURES OF BILL

By Pat Dwyer

Drawings by H. L. Richey

THEY tell me," said Bill, "that on a recent tour hither and yon, you visited Gettysburg and took a gander around the historic battlefield. I was down that way a few years ago and found it hard to realize that this beautiful national park once served as the stage for the greatest battle, the bloodiest, most savage, desperate hand to hand struggle of the Civil War."

"I imagine," I said, "that the same general impression is created in the minds of all the thousands who year by year roll in peace and comfort over the smoothly surfaced winding roads. The average tourist of course is actuated by ordinary curiosity. Depending on his mentality, general background, knowledge of the nation's history and capacity for certain emotions, he views with varying degree of awe and respect the beautiful stone and bronze memorials. A certain number are touched more deeply on inner strings that never fail to vibrate in response to any item connected with the death of an intimate relative whether recently or in the long ago.

"Out of the approximately 150,000 men engaged in desperate combat for the first three days of July, 1863, probably the survivors today could be accommodated in a very small train of cars marked 40 HOMMES 8 CHEVAUX. Assuming an age average of 20 years at the time of the battle it is apparent that these veterans now are 95. For more than the span of the average man's life time, three score years and ten, they have handled the plough share instead of the sword. Still I am willing to lay you a small wager that when the first of July has rolled around each year they did not need any person to prod their memory and ask them if they remembered Gettysburg. Ask them if they remember the choking, acrid smell of powder smoke, the murderous cannonade, the showers of shot and shell, grape and canister, the withering volleys of musketry, the wild excitement of the charge and the savage blood lust of hand to hand fighting with bayonet and smashing gun butts. Those 20 year old lads had what it takes."

"Yes," said Bill, "they most certainly had what it takes and a bit left over for good measure. However, I came across a piece in a book the other day which shows that courage is not confined to the life of a soldier. Men engaged in many industrial occupations display as fine a degree of courage as ever was shown by a soldier walking up to the cannon's mouth.

Industrial study: Driver with Oil Can

"This elegant piece of descriptive writing, as fascinating and thrilling as anything dealing with ruffling drums, screaming bugles and banners bravely flying was written by a lad named Joseph Husband and first appeared in 1914 in a prominent eastern magazine. I found it recently in a book of essays and one thing or another. It is titled *Semaphore* and describes a ride in a locomotive where the engineer trusts his life and the lives of his passengers to the hands of the men who attend to the semaphore lights.

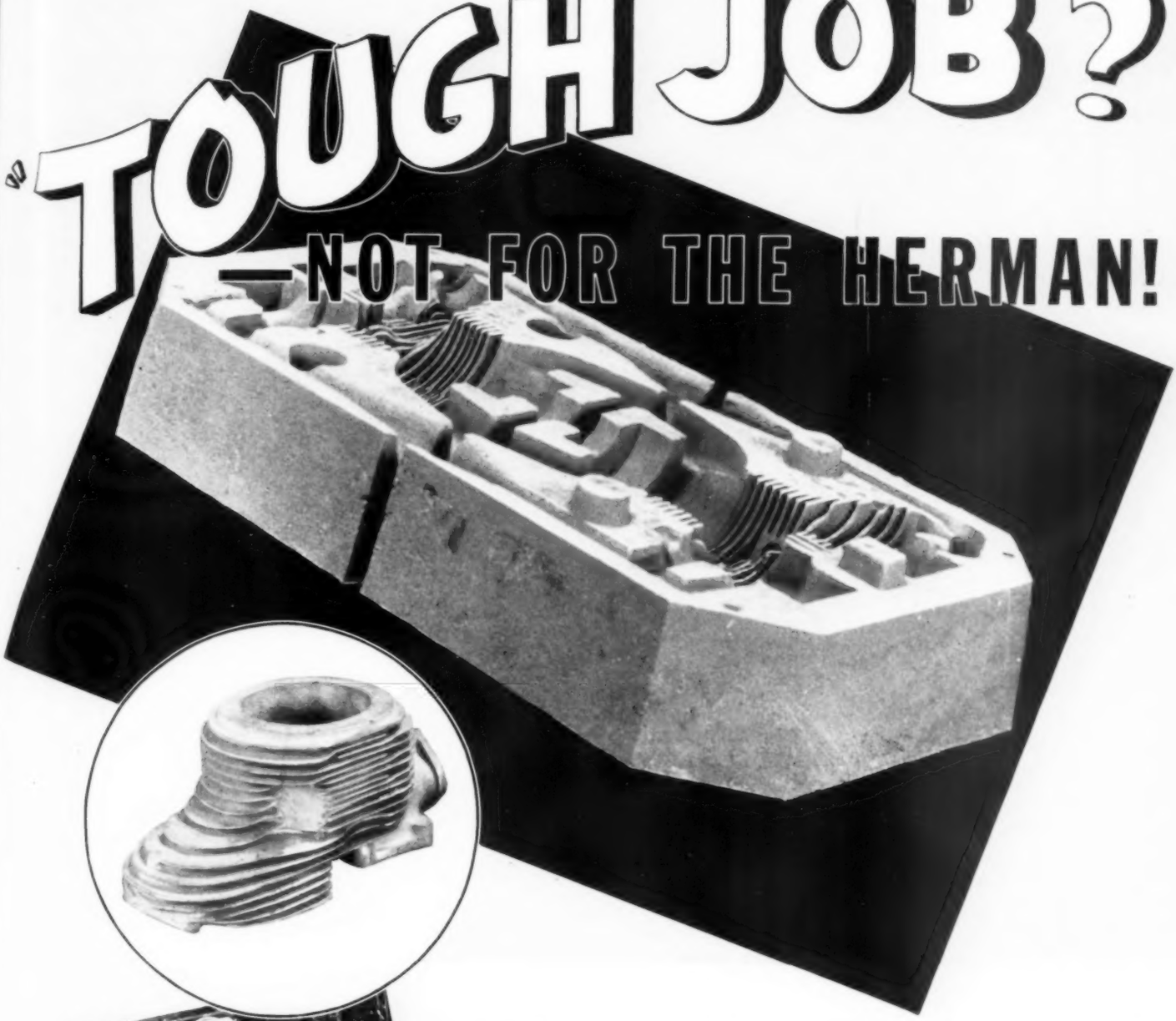
Every night at exactly eight minutes past nine the limited roars through the village. I can see it coming several miles away, its powerful headlight fingering rails and telegraph wires with a shimmer of light. Silently and slowly it seems to draw nearer. Then suddenly it is above me. A wild roar of steam and driving wheels, the wail of its hoarse whistle at the crossing, and then, looming black against the night sky it smashes past, and in the swing of drivers and connecting rods I think of a greyhound, or a race horse thundering down the final stretch. High in the cab window a motionless figure peers ahead into the night. Suddenly he is blackly silhouetted by the glare of the opened fire door, and in the orange light I can see the fireman swing back and forth as he feeds the fire. The light burns against the flying steam and smoke above—and now the white windows of the pullmans flicker past, and through the swirl of dust and smoke I watch the two red lights sink down the track.

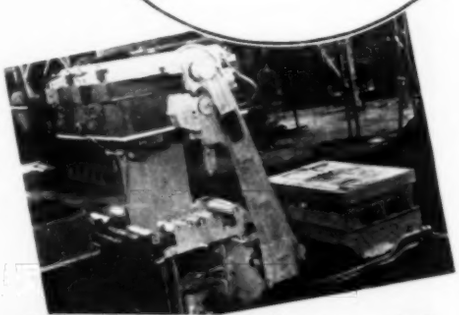
Every time I see the black figure in the cab I wonder how far he can peer ahead into the night, and I wonder at the perfect faith that is his; faith in the silent men who

(*Continued on page* 50)

"TOUGH JOB?"

—NOT FOR THE HERMAN!





ACCURACY in drawing is insured by the hydraulic action of the New Herman. (Top Illustration)

SPEED—instant clamping and unclamping, mold deposited directly on conveyor, plus automatic timing of jarring operation insure *increased production.*

HERMAN MASTERS DIFFICULT ASSIGNMENT

A difficult molding job, airplane engine cylinders, made easy by using Hermans.

Hermans are accurate.

1 The period of jarring is automatically timed.

2 Flasks are instantly clamped and unclamped.

3 Molds are rolled over and patterns are drawn hydraulically.

Quality and *speed* are assured by these features of the new Herman.

It makes no difference if your work is large or small, intricate or simple, the Herman will make it faster and better.

Call in a Herman representative today and have him explain how. No obligation.

HERMAN PNEUMATIC MACHINE CO.

PITTSBURGH, PA.

(*Continued from page* 48)

keep the semaphores lighted and true, and in these humble servants whose constant watchfulness guards him from broken rails and loosened fish plates. Last night I sat beside him.

It was not my limited that I boarded, but a faster, greater engine that helps to rush half across the continent—a train before which all others wait and all tracks are cleared. I stood with the division superintendent on the platform of the little station where it must pause for water. Beyond the yards its song rose clear and vibrant. With a flare of lofty headlight and the grind of brakes it was beside us, steel lungs panting heavily, a reek of oil sweating from heated sides.

The engineer, a torch in his hand, swung down and we shook hands before I climbed the iron rungs of the cab. From the high window I watched him oil and stroke the sinews of his monster. Behind, on top of the tender, the fireman was filling the tanks with a torrent of water. Then they joined me and in the torch light I saw the black studded end of the boiler like a giant cask head, a tangle of pipes across its face, water gage and steam dial dimly illumined by shaded bull's eyes. The engineer blew out the torch and climbed into his seat. Opposite him I settled into mine, the fireman behind me.

There was the thin piping of a whistle in the cab and the engineer slowly opened the throttle. We were off. Rumbling and swaying we passed the upper windows of the station. Telegraphers in shirt sleeves were fingering their instruments beneath shaded lights. The chill of the frosty air penetrated the cab. I buttoned my coat about me and looked ahead into the darkness. We were gathering headway. A string of freight cars on a siding swept behind us. Already the lights of the village were far behind. Ahead of the long body of the locomotive, extending incredibly beyond the small front windows of the cab, the track, hardly visible in the rays of the headlight, terminated suddenly in the darkness. The roar of the drivers and machinery was deafening. From side to side the engine rocked like a plunging derelict. The crashing roar grew louder, loud beyond belief, and the rocking and trembling almost threw me from the seat.

The fireman slid open the jaws of the firebox, flooding the cab with heat and light. Within, the flame, white to pale daffodil in its intensity, twisted like streams of fluid in the draft. Behind the cab, the black end of the tender rose high above my line of vision, rocking and swaying in contrary motion to the engine like a bulldog twisting on a stick. Balancing on the smooth steel floor the fireman stoked his grate bars, his shovel feeding spots where the coal was thinnest. Then darkness as he closed the doors with his foot. Only the two dim lights on gage and indicator. And on each side and above the stars racing evenly beside us. I looked down at the road bed. It was flooding past us like a torrent.

One reason why librarians get gray

"Green," I caught the word above the tumult.

"Green," echoed the fireman.

Far ahead four colored lights gleamed like gems against the sky. Two rubies below; above, another ruby and beside it the pale green of an emerald. The green light was in the upper right hand corner of the square.

"Seventy-five to eighty," the fireman shouted in my ear.

"Block's clear. That green light gives us a clear track."

Already the block semaphores were behind us. Blinded by the rush of air I tried to see the track ahead. Like a dark avalanche the world seemed pouring under our pilot, and beneath I felt the road bed, at last in motion, shivering and swirling like a mill race. From under the engine, puffs of steam shredded into fog rift, white in the light from the round holes beneath the grate bars. And through the two great circles of light projected by them, as from a stereopticon, flickered embankments, telegraph poles, hills and houses like a reeling cinematograph.

"Green," came the confirmation. The fixed green star shone for a minute and flashed past. Faintly I heard the fireman at my ear. "Almost ninety."

Long ago the headlight had become useless except as a warning of our approach. We were past the farthest range of its illumination before the eye could discern what lay before us. Blind and helpless we tore on. Broken rail, a train on the crossing, or open switch—we never would see it. But "Green," shone the light, and wholly trusting in the silent men who flashed to us their word of safety we never faltered. I thought of a stalled train that might lie sleeping on our rails. But, "Green," was the light—their thin cry through the long night watches.

The engineer, silent, his hand fingering throttle and air brake, sat huddled high on his seat. Through his goggles he watched the blackness ahead. A brief second's time to set his brakes was all he asked. Far off in the great city the chief dispatcher was following our flight mile by mile, block to block. Over the wires his voice and the voices of his helpers told the rapid story of our progress. In the lonely tower at the next curve some one would flash the green beacon to our straining eyes and report us on our way. To him, others were now reporting, giving him a certain knowledge that our way was safe. Keepers of the safety of our path. How perfectly we trusted them. How great and unrewarded is their perfect service.

I looked back. Behind, the pullmans cast steady squares of light on the racing cut. Here was our freight. Sons of Mary. Even more blindly they trusted, "peacefully sleeping and unaware." Sons of Martha; they were beside me. "Green," they chorused.

Out of the night came the instant crash of the west bound express. With a blast of air and a slamming roar it seemed to brush us. It was gone.

Through a sleeping village we people pressed back against the building.

"Green."

Like brilliant stars from a rocket gleamed a constellation at a double crossing. Ruby drops of fire, but the

(*Concluded on page* 72)

Problem is where to put the pilot if they take him aboard

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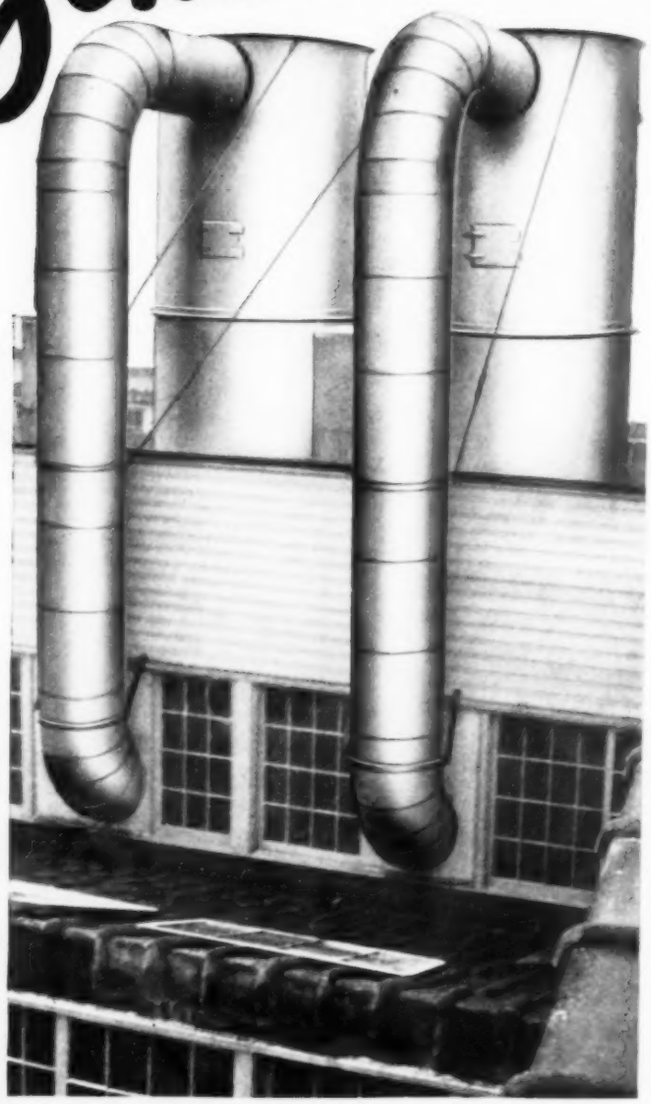
who uses Schneible

Multi-Wash Dust Collectors?



That is a question wise foundrymen should, and often do, ask—so here's the answer!

Users of Schneible Multi-Wash Dust Collectors—big users—are the most critical buyers to be found—*they* do not accept verbal promises of performance; *they* have their own testing laboratories to prove the claims of the supplier—*they* don't take our word for it, *they* know that the Schneible Multi-Wash Dust Collector collects dust and fumes with greater efficiency, at a lower operating cost, and with less maintenance than any other dust collector because it employs no bags, screens or filters; no moving parts; no storage of dry materials; nothing to clog, break, burn or freeze. They fully appreciate the exclusive Schneible five-year guarantee.

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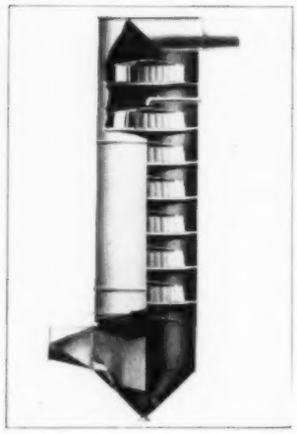
We will be pleased to send you Bulletin 110 explaining the operation of the highly efficient Multi-Wash System, showing installations and listing over 50 leading foundries and industrial users.

IT'S ALL METAL — NO MOVING PARTS— NOTHING TO WEAR OUT —USES ONLY WATER OVER AND OVER AS THE CLEANING MEDIUM!



CLAUDE B. SCHNEIBLE CO.
DUST SUPPRESSION ENGINEERS
3951 LAWRENCE AVENUE, CHICAGO OFFICES IN PRINCIPAL CITIES

Fig. 1—Around the cupola the boys wear safety shoes, leggings and goggles

Establish a Junior Chapter

By R. W. SCHROEDER
Foundry Instructor
Crane Technical High School, Chicago

FOUNDRY students in Crane Technical high school, Chicago, recently organized an association to bring them into closer contact with the foundry industry and with adult foundry organizations. Aims and objects are set forth in the following preamble to the constitution: We, the student apprentices in the foundry of Crane Technical high school, in order to promote a better understanding of the foundry industry and to provide a close relationship between ourselves and the foundry industry do hereby form an organization to be known as the Junior Foundrymen of America.

Officers and members of the Chicago chapter of the American Foundrymen's association took an active and sympathetic part in the movement and rendered valuable assistance in the formation of the new association.

The suggestion first was offered a few years ago that the outstanding foundry pupils in each high school be formed into a junior chapter. Through this group a supply of earnest students could be directed into a field needing skilled mechanics. The employers would have a group of potential foremen well grounded in practice and theory. The project lay in abeyance until the Smith-Hughes classes were established in the school.

All students entering Crane Technical high school enroll in the regular technical course for 2 years. At the end of that period a student interested in a particular shop enrolls in the Smith-Hughes course for that subject. Students in these classes work 3 hours per day for four semesters, a total of about 1140 hours of practical work, molding, coremaking, operating the cupola and pit furnaces, mixing facing, grinding, chipping and sand testing. Three hours per day are spent in related subjects, shop mathematics, English, mechanical drawing, blueprint reading, physics, chemistry and economics. From the foregoing it is apparent that the boys' academic education is not neglected, but fits into his life work plan in a practical manner. Under close supervision a great deal can be accomplished in the given time. Student foremen and clerks receive valuable training in giving orders and in following work orders through the shop.

Preliminary work leading to the formation of the association and to

(*Concluded on page* 72)

Fig. 2 (Right)—In the sand testing laboratory. Fig. 3 (Left Below)—Boys become familiar with the use of tools. Fig. 4 (Right Below)—Temperature of the metal is taken with a pyrometer

Features Two-Storey Foundry

(*Continued from page* 25)

ber from which it is removed at periodic intervals. The nozzle is swivel jointed so that it may be moved to one side temporarily while the cupola man is opening the slag hole.

Safety features, order and neatness in front of the first floor cupola are shown in Fig. 2 where the top rail of a fence surrounding the ladle pit is painted in contrasting colors. An auxiliary spout under the main spout directs the metal into an oblong covered mixing ladle shown at the left. The regular run of gray iron constituting the bulk of the charge passes through the mixing ladle. Semisteel mixtures amounting usually to 3 tons per heat flow down the straight spout and into a crane ladle. The cupola supplied by the Whiting Corp., Harvey, Ill., is lined to an inside diameter of 54 inches and melts approximately 12½ tons per hour.

Contrast between former and present methods of removing cores and adhering sand from the larger castings is shown in Figs. 4 and 6. In the first the casting was hammered to loosen the sand. In the recently installed method the sand is knocked out of the casting between two upright hollow units. In one of the units a stream of air is blown through a slot about ⅜-inch wide near the top and along the edges of the upright sides. The screened unit on the opposite side is attached to an exhaust line which sucks in most of the dust and deposits it in a collector. The waste core and molding sand fall through a grating in the floor and into a bin where a slight suction removes the dust as shown in Fig. 5.

Castings are cleaned in several large sandblast chambers. A combination unit made by the American Foundry Equipment Co., Mishawaka, Ind., and shown in Fig. 16 is loaded by a short conveyor unit which discharges the castings directly into the cleaning device. Small castings from the upper floor fall through a spiral chute on to the conveyor which then moves forward until the end approaches the opening in the wheelabrator. Later when the castings are cleaned the conveyor is moved back to clear the gangway where a truck receives the clean castings. An exhaust system collects and removes all dust from this cleaning device. In a similar manner dust is collected and removed from the various grinding wheel stands, and from the facing sand mixing unit made by the National Engineering Co., Chicago, and shown in Fig. 3. Apparently in this foundry the dust hazard has been reduced to the fullest extent of which human ingenuity, engineering knowledge and mechanical equipment are capable. One of the tangible results is a recent 35 per cent reduction in the company's occupational disease insurance premiums.

Ladles Are Preheated

Figs. 8 and 9 illustrate the modern method of preheating ladles with oil burners and offers marked contrast to the former method where the ladles were dried with wood fires. According to a ruling of the state labor board the ladle heating had to be done at the noon hour when no employes were in the shop. As a result while the ladles were fairly dried they were stone cold when the first iron was tapped at 3 p. m. In some instances the heat developed was not sufficient to dry the lining thoroughly and as a result the steam caused the iron in the ladle to boil more or less violently.

A permanent installation is shown in Fig. 8 where two oil burning units are mounted on a platform on one side of a brick wall, while the mouth of the crane ladle is brought up against the wall on the opposite side. In this manner the lining is dried and brought up to a red heat before the ladle is taken to the cupola. There is no residue of ashes, as with a wood fire to settle on the bottom and prevent the heat from penetrating that section of the lining.

Use Hoisting Equipment

The portable unit shown in Fig. 9 is employed on the second floor for drying the cylindrical covered ladles of 1000 pounds capacity, and the smaller ordinary type covered ladles of 400 pounds capacity. These ladles supplied by the Modern Equipment Co., Port Washington, Wis., are provided with hoisting equipment and designed for one man operation as shown in Fig. 15. Naturally, after a little practice the operators develop speed and skill and distribute the iron more rapidly, efficiently and at a lower cost than by the former hand ladle method. The covered and insulated ladles maintain the metal at a uniform high temperature.

Radical changes in floor arrangement and method of operation are shown in the before and after illustrations Figs. 12, 13 and 14. The view in Fig. 12 taken from the north east corner of the foundry on the

(*Continued on page* 56)

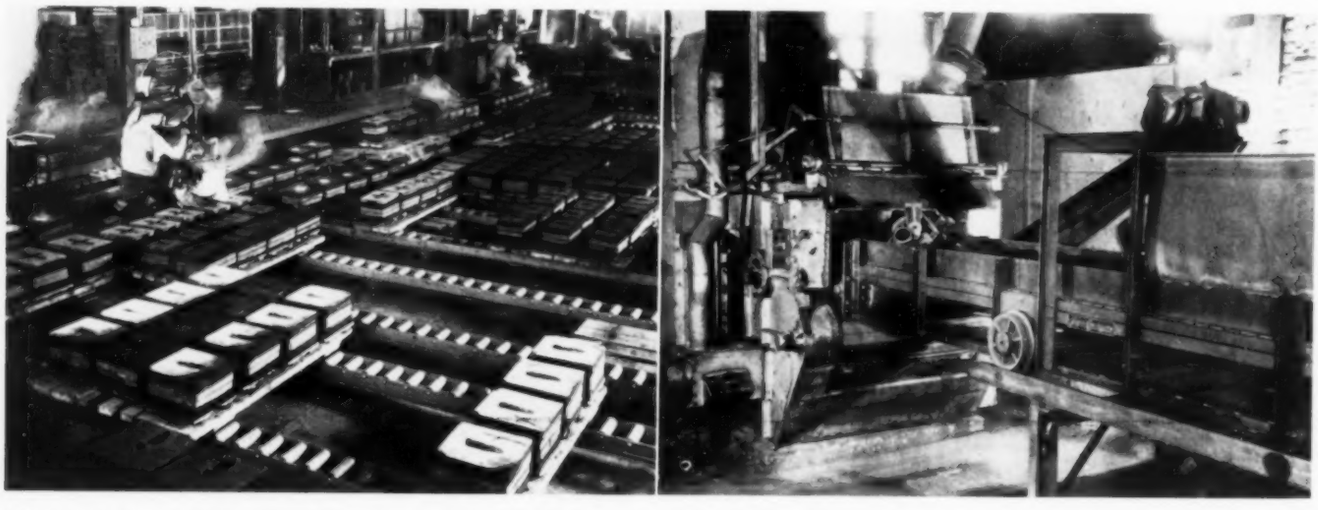
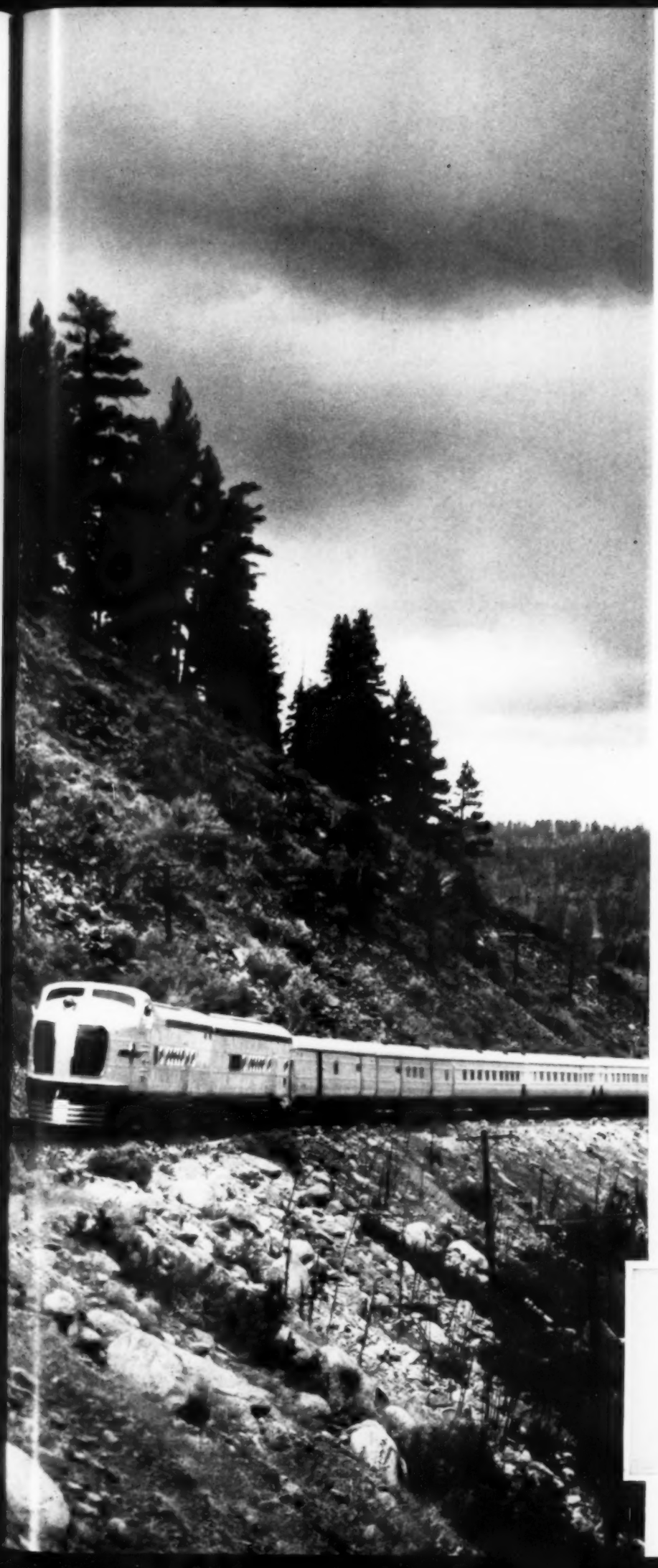


Fig. 15 (Left)—Ladles suspended from a monorail are quipped with hoisting apparatus and are readily handled by one man
Fig. 16 (Right)—A transfer car delivers the castings to a device where they are subjected to the action of metal abrasive while tumbling rapidly



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The Carborundum Company is justly proud of the part played by its abrasive products in the development of internal combustion motive power for the American railroads.

AN INVITATION TO EXECUTIVES CONCERNED WITH MANUFACTURING

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ABRASIVE PRODUCTS

FOR ACCURACY AND ECONOMY IN MANUFACTURE

(*Continued from page* 54)
upper floor illustrates the cluttered up, crowded conditions which brought the decision to undertake a complete revamping.

Fig. 13, which was taken from the same position shows the present orderly arrangement with ample room, wide open gangways, molds in symmetrical rows on conveyor units, no loose sand on the floor and a general air of neatness, alertness and engineering efficiency. Fig. 14 is a view of the same interior

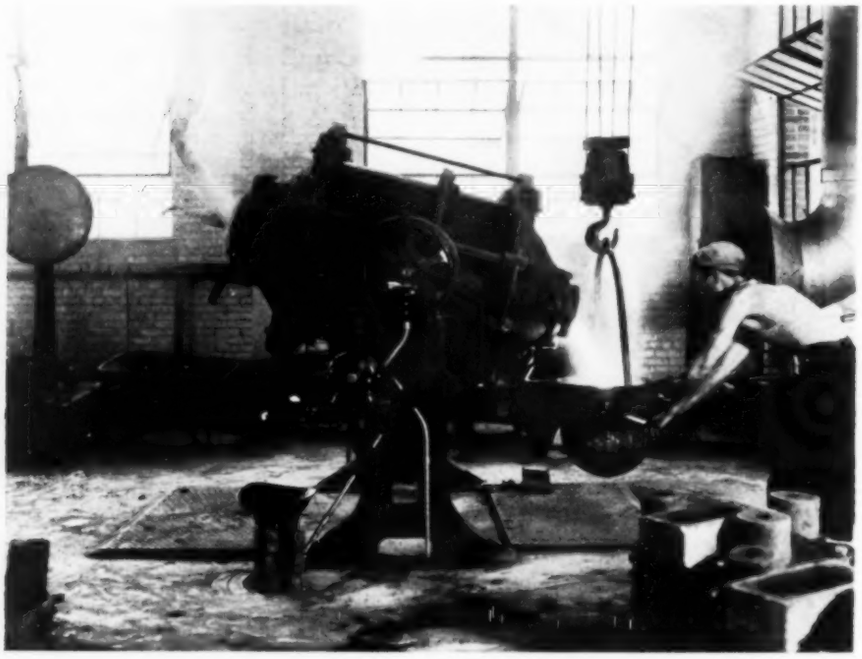

Fig. 17—Large heats of uniform quality bronze for worm gear blanks are melted in a revolving, tilting, oil fired furnace

taken from the south east corner. Space from the center to the north end of the shop is devoted to the production of small castings in snap flask molds. Larger castings up to 100 pounds in weight are produced on the other half of the floor extending from the center line to the south end of the building.

Molds from the machines are placed on roller conveyors where each succeeding mold or row of molds pushes the preceding mold or molds toward the front. Top of each conveyor unit for the small molds is 8 inches above the floor. Cleats on the bottom of a 6-foot plank 2 inches thick ride the rollers on two adjoining conveyor units. From four to five molds, depending on size, are placed on the plank. The process is continued with each loaded plank pushing the one in front until the conveyors are loaded.

A slightly different technique obtains in the south half of the foundry where the molds are made in steel flasks with an individual bottom board under each mold. Cleats on the board ride the rollers on single conveyor units. Tops of these conveyors are 15 inches above the floor to correspond to the height of the long conveyor shown in the foreground Fig. 13. This conveyor extends from one end of the shop to the other end and carries all the molds to the shakeout at the south end.

The small molds are lifted by hand and dumped into 30 x 30-inch metal containers or rectangular steel frames resting on 32-inch square bottom boards on the long conveyor. Flask bottom boards and bands are removed and returned to the vicinity of the molding machines. The containers with sand and castings are moved along the conveyor to the shakeout station.

The large molds are rolled on from the transverse conveyor lines with a minimum amount of time and effort. The pouring schedule is arranged to permit removal of molds in front before the ladle returns to pour the following row. In that manner the molds are poured in orderly sequence and the long conveyor is neither over nor under loaded at any period.

At the end of the long conveyor line the castings are shaken out. Flasks are returned by separate conveyor to the rear of the various molding machines. Castings are loaded in trucks and either taken by elevator to the lower floor cleaning room, or dumped into a spiral chute opening leading to the wheelabrator conveyor.

Sand falls into a hopper and through an adjustable gate to an apron conveyor and thence in turn to a bucket elevator, sand screen, to feeding hopper, magnetic pulley to pug mill where water is added. From the pug mill the sand enters another bucket elevator which discharges into an aerator. From here the sand is taken by flight conveyor and discharged into the line of hoppers above the molding machines. The sand handling equipment was designed by the Osborn Mfg. Co., Cleveland, with shakeout and screens made by the W. S. Tyler Co., Cleveland. The Otis Elevator Co., erected the equipment. On the first floor sand is cut by hand to the vicinity of individual bucket elevators which carry it aloft and discharge into hoppers above the molding machines.

A considerable amount of experimental work was involved in developing a sand that could be handled in bulk, and yet prove satisfactory in the molds for a wide variety of castings ranging in weight from ounces to 100 pounds. Irrespective of other factors, one of the prime requisites of all castings is that they shall present a clean, smooth surface. A fine grain, highly bonded sand will produce this type of surface on light castings, but if it does not buckle or scab it will fuse or burn on to the face of heavy castings. A coarse grain lightly bonded sand will strip clean from heavy or light castings, but it will produce a rough, pock marked surface on light castings.

Develop Satisfactory Sand

In this instance a satisfactory compromise was effected through the use of No. 1 Albany sand as a base sand with the following characteristics as defined by A. F. A., standards: Fineness 180; class *E*; clay content 14.14 per cent; permeability 12.2; green compression strength 6.8 pounds. Through the removal of fines at the shakeout and addition of silica sand with a grain fineness of 48 from the cores, the permeability of the sand is maintained at approximately 45, with a moisture content of 5.8 per cent. Condition of the sand is watched carefully. Samples are taken regularly and tested in the laboratory.

In addition to the gray iron foundry the Otis Elevator Co., also operates a well equipped nonferrous foundry in a separate building. Typical former methods and equipment in the nonferrous foundry are shown in Fig. 7 where the metal was melted in a battery of five coke fired pit furnaces surrounded by the usual litter of coke, scrap and old crucibles in various stages of decomposition.

Under the new regime oil fired crucible furnaces made by the Campbell-Hausfeld Co., Harrison, O., were installed as shown in Fig. 11. The battery is provided with a hood in four sections for collecting

(*Concluded on page* 59)

(*Concluded from page 56*)

and diverting the smoke and fumes through a stack. Each section of the hood is controlled by a light cable by which it may be pulled up out of the way when placing the crucible in, or removing it from the furnace. Oil and air valves are mounted at one end of the battery within convenient reach of the operator who controls the melting. Air, oil, water and steam pipes for various purposes, also electrical conduits for power and light wires are located in the basement which underlies the entire building and which also serves as a store room for metals, flasks, sand, brick, crucibles and other miscellaneous materials used in the operation of the foundry.

Unit Is Elastic

The crucible furnaces constitute an elastic melting unit in that at any given time each crucible may contain a mixture different from any of the others. Again they may be combined in pairs to melt two different mixtures, or all five may be charged with metal conforming to the same specification. Each furnace is lined to accommodate a No. 60 crucible with a holding capacity of approximately 180 pounds of bronze.

For large castings uniform batches of metal are melted in two revolving, tilting oil fired furnaces made by the U. S. Smelting Furnace Co., Belleville, Ill. One of these furnaces with a capacity of 1000 pounds per heat is shown in Fig. 17. Metal from this furnace is poured exclusively into bronze gears. Metal from the second furnace, capacity 500 pounds per heat, is poured into bearings, sleeves and other castings made in considerable numbers. During the melting period the furnace is revolved by a ring gear round the center of the barrel. The tilting gear and the small motor by which it is operated are mounted on the outside of the frame supporting the furnace and with the push button control clearly shown in the illustration. An exhaust pipe with expanded opening suspended a short distance from the pouring spout of the furnace, removes all smoke and gas incident to operation.

Charges for the furnaces and for the crucibles are made up with the greatest care and weighed accurately. Pyrometers are used to check the temperature of all metal before it is poured into the molds.

Black & Decker Mfg. Co., Towson, Md., has opened a factory service branch at 935 North Illinois street, Indianapolis, with H. F. Linder as service representative and M. D. Mooers head of the sales department.

Reader's Comment

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of The Foundry or of Its Editors.*

Old and New

TO THE EDITORS:

Usually I pass my copy of THE FOUNDRY on to others to show them how valuable it is. However. I regret to admit that many molders seem to be more interested in baseball scores and other humbug. I ought to know. I have managed foundries successfully for the past 26 years and have handled all kinds of labor except Chinese and Japanese. When I read some of the questions in THE FOUNDRY I am astonished to note apparently how little some men know about the trade at which they make a living.

I doubt if my experience can be matched by many foundrymen. I have managed an architectural and statuary foundry, a manganese bronze foundry casting propellors up to 10,000 pounds, a foundry specializing in valves and pressure castings, an aluminum foundry engaged in the production of automobile castings; general jobbing gray iron foundry, foundry casting heat treating boxes, high speed steel foundry casting drills and dies, and a large foundry engaged in the production of lighting fixtures. For the past three years I have been operating my own foundry.

Recently I noted several inquiries about coating castings with abrasive material. In 1923 when I was foundry superintendent in the plant of the Flour City Iron & Brass Corp., Minneapolis, Minn., we had a job of that kind embracing 60 tons of castings. I experimented for a month before I developed the proper technique. The process was described in THE FOUNDRY of that year.

In a recent issue I noted two inquiries about blowholes in bushing castings. If the inquirers had read THE FOUNDRY consistently one would have known that he was working his sand too wet. The other would know that he rammed the sand too hard and dried the mold too much. Actually burned the surface and took the life out of the sand.

I recall with pleasure an incident where I was the sixth foreman in a 10-year period. The oldest molder did not like me, but at one of the noon hour conferences he told the bunch "This fellow from New York city is the first d—— man ever to come in here and give us decent hot iron." The only change I had made in the setup was to have the belt tightened on the blower. I am still receptive and willing to learn.

AUGUST M. ROTH

Roth Foundry
135 Grand Street
New York

Must Be United

TO THE EDITORS:

In connection with the Engineering Data program of the Gray Iron Founders' society, on which you made such friendly comment in your July issue, we should like to draw attention to the fact that manufacturers or "captive" foundries, as they are sometimes called, are eligible for membership in the society and applications therefrom will receive a warm welcome.

United support of the gray iron foundry industry will be absolutely necessary if we are to succeed in bringing it to its rightful place as a supplier of engineering material of the first order.

W. W. ROSE,
Executive Vice President.
Gray Iron Founders' Society,
Cleveland.

Shows Equipment

American Foundry Equipment Co., Mishawaka, Ind., has released a new industrial motion picture illustrating its centrifugal blast cleaning equipment. The greater portion of this film is devoted to full color views of the equipment in operation in production foundries. Types of cleaning demonstrated include: Automobile cylinder blocks; brake drums; carburetors; steel, gray iron and malleable castings; heat treated gears and splines; and stove plate.

Publishes Paper

National bureau of standards, Washington, has published research paper RP1084 on "Fire-clay Ladle Sleeves," by Raymond A. Heindl and George J. Cooke which describes an investigation of those types of sleeves in a steel foundry and in the laboratory. Copies of the paper may be secured from the superintendent of documents, Washington, for 5 cents each.

Fifth annual Metal Mining convention and exhibition, Western division, American Mining Congress, will be held at the Ambassador Hotel, Los Angeles, Oct. 24 to 27.

Among Detroit Foundries

(*Concluded from page 29*)

scarce, the time is ripening when a small car, priced at around $350 or $400, will find plenty of buyers.

Tool and die shops around Detroit have been told to have all their men back from vacations by Sept. 1, and in turn these shops have instructed their foundry sources that additional die work is expected. So by the time this appears in print it seems fairly certain some of these small car programs will be under way, to permit their introduction at show time in November.

In addition, the large die foundries are expecting some releases on duplicate dies to help keep them busy this fall. These foundries, and there are not so many of them, ordinarily find slim pickings from September until spring. When the die programs are out of the way, they are forced more or less to loaf until the new programs appear. This is typical of many suppliers of the automotive industry, so highly seasonal is the business.

Looking Toward 1940

This year, consensus of opinion seems to be that body changes have been minimized with the result that the body die business has not been up to expectations. Further, some of this work has been placed outside Detroit, and even outside of Michigan. Local shops have suffered as a consequence. Already, however, die producers are looking to 1940 models as the source of a real boost in their business, since rather complete changes in lines are in prospect.

Considerable secrecy naturally surrounds the production of body dies. The auto companies do not care to see advance information on new models becoming public property. Often, large dies are split up and cast in sections so that it is impossible to gain any conception of the finished lines. Some years ago, when the turret top first was introduced and dies were being ordered for the stampings, so much curiosity was aroused in one of the foundries making the dies, that a "decoy cancellation" on the job was issued by the purchaser, but the foundry management was told privately to go ahead with production.

Two developments of interest to foundrymen are in the wind as far as models now going on assembly lines are concerned. One is the prospective change by Ford to hydraulic brakes. According to information in trade circles here at present, the change to hydraulic brakes by Ford and Lincoln is all set, although it must be remembered such a move was almost made at new model time for the past several years. This time the change is reported to be definite, with Wagner Electric Corp. figuring prominently as a source of supply. Ford usually tries to arrange to meet about half of production requirements in his own plants, but whether such an arrangement has been concluded for brake production is not known officially.

Licenses to manufacture hydraulic brakes are all controlled by Lockheed Hydraulic Brake Co. which in turn has granted to Wagner an exclusive manufacturing license, General Motors, Chrysler and Packard. General Motors is supplied through Delco Products and Bendix Products, the latter also supplying Packard. Chrysler is licensed separately to make this type of brake, being one of the first to adopt it.

Propose Liquid Flywheel

The second development of current interest relates to transmissions and the application of the often-mentioned hydraulic torque converter or fluid flywheel in place of the conventional flywheel, clutch and gearbox. The fluid flywheel would do away with flywheels, clutches and gears altogether and would provide essentially an infinitely variable transmission, slippage between a driving member and driven member being dissipated as heat through oil.

There are several versions of this transmission which originated abroad and which has been the subject of extensive experiments here for the past 5 years. A new line of buses being built by Yellow Truck & Coach in Pontiac will have one type of hydraulic torque converter which has been described as an impeller-type pump transmitting power and required speed through the medium of a noncompressible fluid, which in turn actuates a hydraulic motor connected to the propeller shaft.

Apparently another type of hydraulic transmission has been perfected by Chrysler and at the present writing seems likely to appear on the new Chrysler Imperial model. Such a change, should it be expanded to others in the Chrysler line, would have its effect on the Dodge foundry here which supplies all flywheel requirements of the company.

Another topic coming in for wide discussion in foundry circles concerns methods developed and applied practically in recent months for the chemical or heat treatment of surfaces of machined and ground cast iron parts to overcome initial scuffing or scoring and galling. At least four such methods are now in use or on the verge.

One is the Ferrox treatment developed by Perfect Circle Co. and used on piston rings. It involves the formation of a black oxide of iron on the surface of the rings by subjecting them to an oxidizing atmosphere at about 1250 degrees Fahr. Good results are claimed as far as elimination of scuffing is concerned, but there is some question among metallurgists as to the effect of the heat treatment on the wearing qualities of the base metal.

Finish to Prevent Scoring

A second treatment, in the chemical class, is the Granodizing treatment of American Chemical Paint Co., involving the deposition of a manganese phosphate coating on the treated surfaces, which acts as a wick for lubricant. This has been applied to rings, valve tappets, camshafts, and is being proposed for crankshafts, pistons, cylinder walls and other parts. The coating is deposited by immersing parts in a bath of phosphoric acid and manganese dioxide, with no current involved. White Motor Co., Cleveland, has completed such an installation, as has Chevrolet at Bay City, Mich., for valve tappets and Oldsmobile for camshafts.

A third method is that being developed by Parker Rust Proof Co. here, involving the use of this company's Bonderizing solution. This, of course, is similar to the Granodizing process.

A fourth system is the Ferritex process developed by Standard Oil Co. of California, Richmond, Calif., and about which little is known except that it is claimed to be a sulphide treatment capable of minimizing scoring and scuffing.

Concurrently the work which Chrysler engineers are doing toward expanding the use of a so-called superfinishing process for machined cast iron surfaces is of interest, mainly for the reason that it appears to be directly opposite in aim to the processes which seek to roughen surfaces artificially to hold oil, while the superfinishing process aims at microscopic smoothness of such surfaces, produced by rapidly oscillating abrasive tools, working under light abrasive pressures and with fairly hard abrasives and a suitable oil lubricant.

The 31st annual edition of *Metal Statistics* has been published recently by the *American Metal Market*, 111 John St., New York. The book gives statistical references of iron, steel and nonferrous metals, fuels and miscellaneous subjects. The price is $2.00 a copy.

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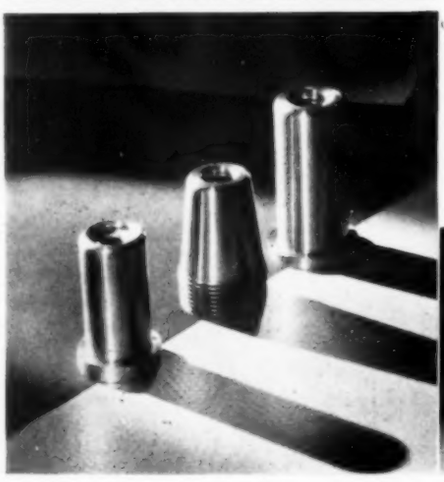


NORTON

Table I

Data on Sands A and B

Sand	Moisture Per Cent	Permeability	Green Compression—Pounds	Dry Compression—Pounds	Resilience	Clay Per Cent	Sintering Temp. Degrees Fahr.	Expansion Inches per Inch	Contraction Inches per Inch
A	8-7	23	6.1	52.0	128	14.2	2337	+0.020	—0.047
B	8-2	44	16.3	55.0	277	28.1	2537	+0.015	—0.004

Does Your Sand Behave?

(*Concluded from page* 28)

raised gradually from room temperature to 2500 degrees Fahr. Sand (*H*) shows a maximum expansion of 0.016 inch and a maximum contraction of 0.008 inch. Sand (*H*) is a steel molding sand of the type commonly used in steel foundries. The sand (*I*) is the same sand with 3 per cent cereal binder added. Maximum expansion is reduced to 0.009 inch while contraction increased to 0.040 inch.

A molding material that expands very little may be compounded by using calcined clay particles for sand grains. Such a compounded sand is (*J*) in Fig. 8 with a maximum expansion of 0.003 inch and a maximum contraction of 0.01 inch. When a very refractory clay is used to bond the sand (*J*) all of the contraction may be eliminated up to 2500 degrees Fahr.

In conclusion it may be pointed out that expansion and contraction of molding sand should be at a minimum to secure best dimensional stability of the sand. When a molding sand is used that has excellent dimensional stability then greatest freedom from casting defects is obtained.

Subjecting sand specimens to shock temperature immersions of 2500 degrees Fahr. affords an excellent opportunity of observing visually how a certain sand mixture will behave in a mold.

The expansion and contraction test on foundry molding material will yield probably more practical information than any other test on sand. Through information obtained from such tests foundrymen will learn how to save the mold surfaces and save castings.

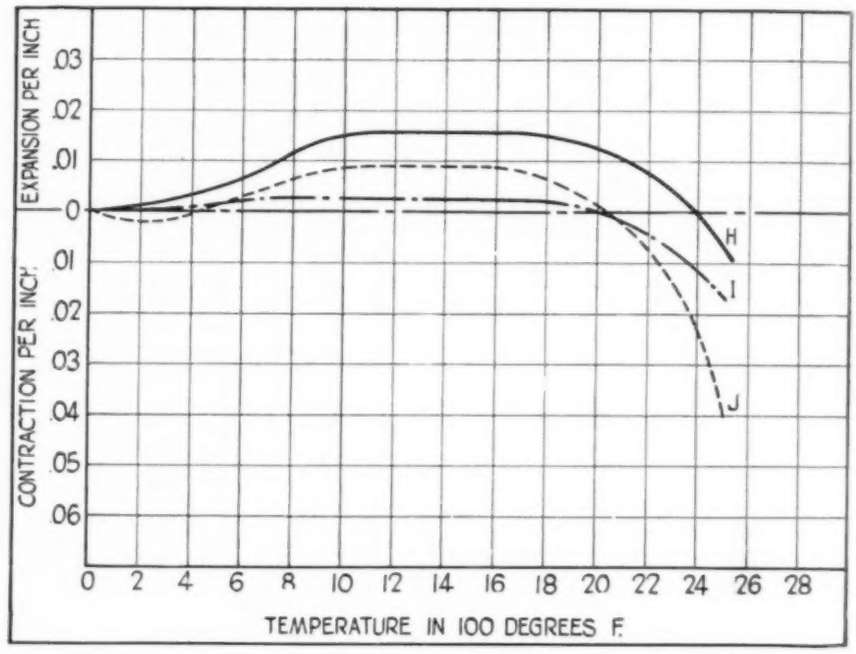


Fig. 8—Expansion and contraction of sands H, I, and J upon gradual heating

Table II

Data on Sands C, D and E

Sand	Moisture Per Cent	Permeability	Green Compression—Pounds	Dry Compression—Pounds	Resilience	Clay Per Cent	Sintering Temp. Degrees Fahr.	Expansion Inches per Inch	Contraction Inches per Inch	Mold Hardness Number
C	3.9	120	4.1	13.5	60	7.0	2392		—0.022	85
D	5.3	90	3.7	50.0	111	6.5	2442	+0.008	—0.012	55
E	4.7	110	6.7	25.0	114	9.7	2420	+0.14	—0.009	87

Table III

Data on Sands F and G

Sand	Moisture Per Cent	Permeability	Green Compression—Pounds	Dry Compression—Pounds	Resilience	Sintering Temp. Degrees Fahr.	Expansion Inches per Inch	Contraction Inches per Inch
F	2.2	138	9.5	67	115	2356	+0.019	—0.028
G	1.8	143	6.6	77	92	2588	+0.012	—0.011

Volume V of a series entitled, "Available Raw Materials for a Pacific Coast Iron Industry," by E. T. Hodge has been published by the war department, office of the division engineer, North Pacific division, 523 Pittock block, Portland, Oreg. It describes many ore deposits in Washington, Idaho, and Oregon. A feature is a description of the Ruzicka process for making metallurgical coke from wood with the byproducts obtained. Cost of the publication is $1.

Steels Designed For Use

(*Continued from page* 31)

reversed action on cooling indicated great sluggishness of the steel in response to heat treatment. A long series of experiments provided information of the greatest value for the development of a more suitable heat treatment.

Of principal interest was the data obtained in regard to the factors controlling the characteristic network formation that is nearly always present in chromium steels with tungsten or molybdenum. It can be definitely stated that two conditions control the structural characteristics of these steels; namely, temperature which is of primary importance, and time which is of lesser importance.

This network may be found originally in the casting and it is undoubtedly due to selective freezing. Subsequent cooling in the solid state and heat treatment bring about diffusion and equalization of composition in some degree, but generally not a state of complete homogeneity. With this type of steel it is probable that the network consists of ferrite that is relatively rich in chromium and carbon.

Chromium Is Less Soluble

The chromium content of the network which conveniently may be termed chrome-ferrite to agree with the nomenclature adopted for stainless steels, renders it less soluble in the etchant than the remainder of the metal and it consequently appears as a light colored constituent.

It can be stated definitely that the network can be controlled, depending upon the heat treatment, but in reality it is merely effaced and not eradicated entirely, thereby indicating extreme sluggishness in diffusion rate in solid solution.

Where the rate of cooling is slow, the network can be shown to have a definite crystalline structure; possibly carbides much finer than in the body of the metal. With the rate of cooling slow enough to correspond to an anneal, there is a precipitation in the network of a certain constituent. Sodium picrate, used as an etching reagent, indicated a segregation of carbides in the network of the annealed structure and a view of this dark constituent at high magnifications showed a definite crystalline structure resembling that of an eutectic.

As a possible explanation of the nature of this network, it may be hazarded tentatively that it consists originally of a solid solution of segregated carbides in high chrome ferrite. Upon certain favorable conditions of cooling, the carbides are precipitated much after the manner of the insoluble phase in precipitation hardening alloys, and when steel is fully annealed they may agglomorate into large masses which are rich enough in carbon to be stable in the sorbitic condition upon cooling.

It is possible that the agglomorated material is an eutectic between the carbides and the chrome ferrite, a supposition not incompatible with the sorbite designation.

The ideal structure in chromium steels with tungsten or molybdenum is clearly one of fine grained tempered martensite or sorbite without any visible network. To insure the absence of the network to a harmful degree, it was evident that prolonged heating at temperature above 1600 degrees Fahrenheit must be avoided. Because of inherent sluggishness of steel, it was equally evident that long soaking periods would be essential.

Heat the Steel Uniformly

Therefore, the most certain method of providing the necessary soaking period without promoting network formation unduly, was to carry out this portion of the treatment at a temperature slightly below the critical transformation point. In this way the steel could be brought to a uniform heat throughout and be on the verge of recrystallization without danger of network formation in the metal.

This soaking period then could be followed by a normal period of heating just above the critical transformation to bring about complete recrystallization and grain refinement with minimum opportunity of segregation.

Steels which have been given this treatment and then rapidly cooled and carefully drawn back to a temperature below the critical transformation point and allowed to cool slowly to black heat have been found to posses exceptionally fine structure and physical properties, free from the erratic results obtained by usual heat treatment.

Double annealing causes a very small grain size. Normalizing and annealing give about the same grain size as double annealing. Normalizing and drawing gives a very fine grain size with excellent dispersion of the constituents. Double normalizing, followed by drawing, gives a similar structure, except smaller grain. Water quenching gives a very fine grain structure. Step normalizing followed by drawing, gives the finest grain size of all treatments.

Better mechanical properties are always obtained by double treatments, especially normalizing and drawing and the step normalizing and drawing. These treatments give a very high ratio of yield point to tensile strength, together with high impact and elongation.

The original work on the normalizing, double normalizing and draw treatment was carried out in our laboratories, and first published in the *Transactions*, American Foundrymen's association in 1924, and later in the report of Victor M. Mazurie, on the *Heat Treatment of Steel Castings*, Detroit Edison fellowship, 1925, University of Michigan. It is stated that normalizing, followed by draw (which was the treatment recommended and used by the Chapman Valve Mfg. Co.), "by far the best all-around properties are obtained by normalizing and draw treatment where high strength, high ductility, and good impact strength, are required."

Develop Step Normalizing Process

In 1931, a research investigation was conducted by the author with Dr. Wescott, developing the step normalizing treatment which has been of the greatest value in the heat treatment of alloy steel castings. These two treatments are used almost exclusively in the treatment of alloy steels by the foundry with which the author is connected.

Rapid advances in the use of high pressures and temperatures in industry have consequently imposed more rigorous demands on castings for this service, and it is, therefore, essential that the capabilities and limitation of the castings be accurately known so that safety of operation can be adequately assured.

No precaution is too great where it is posible that a single failure may cause loss of life and enormous property damage. Such a potentiality places a high premium upon acurate knowledge of properties of metals that enter into the manufacture of castings and the assurance of dependable quality.

Metallurgically, the more exacting demands have been satisfied by the development of special steels, but the formulation and adoption of specifications, framed specifically to satisfy changing conditions, has lagged far behind the practical application of new alloys. It is realized that specifications for this type of work represent a radical departure from previous practice and is certain, therefore, to cause divergent opinions as to its practicability. As preliminary to such discussions it may be stated that its economic workability has been demonstrated on many occasions in regular foundry practice.

Casting specifications make no

provision for the determination of physical properties of the casting itself that actually goes into service, the limiting requirements being invariably intended to apply to test bars attached to the heavier castings, but more generaly are cast attached to separate blocks. The relationship of the properties of the metal in separately cast test blocks and the casting itself may be variable for a number of reasons, so that the user has been forced to hope that the properties approximate each other. Allowance is made for any existing difference by applying a large factor of safety, which can be termed more aptly a "factor of ignorance."

Empirical Tests Not Satisfactory

It has been repeatedly asserted that it is impractible to judge the quality of a casting by the results taken from the casting itself, and the only safeguards offered have been destructive and hydrostatic tests, neither of which provides information which may be translated in a quantative manner into terms of serviceability.

These empirical methods of testing and inspection are no longer considered adequate by the purchaser when applied to severe service castings, as is attested by the growing tendency towards testing of specimens from castings in both impact and tension, and the radiographic inspection of individual castings.

One of the most essential properties of a casting for severe service is ductility, as a ductile metal will give warning of impending failure by deformation, whereas a brittle metal will fail suddenly without deformation, and hence without warning. Brittleness may be caused by internal defects and general unsoundness, improper heat treatment, or in some steels, by slow cooling from the operating temperature.

Proceeding with the knowledge that casting quality cannot be determined by separately cast test blocks, it is necessary to consider the various tests that can be utilized for this purpose. They may be grouped into two classes: Destructive tests that can be applied economically to smaller castings, and nondestructive tests, which must of necessity be used for larger and more expensive castings. In the first group of tests sufficient consideration has already been given to the importance of the determination of the physical properties of castings.

A valuable adjunct in the detection of internal stress is supplied by macroetching of sections taken from critical points in the castings. It is extremely advantageous because of its simplicity and inexpensiveness and can be used very effectively if carried out under standardized conditions by experienced observers on pilot castings. The usefulness of macroetching for improving foundry practice is that it shows strains, not tears, etc., and gives the foundryman an idea of how to eliminate same.

A common type of destructive test is quite extensively used in casting inspection. It is the drop ball impact test. The value of this test, however, is questionable, because of the numerous uncontrollable factors which are introduced, and lack of standardization in its use, and because it does not provide any quantitative measure of casting quality.

Of the nondestructive methods of inspection the best known and most used is the hydrostatic test. Because of the general recognition of the absolute necessity for this test and its practically universal use, it need not be given any further consideration, except to note that it does not measure any property of a casting other than its ability to withstand a definite static fluid pressure.

Heat Treatment Important

It has been mentioned previously the importance of effective heat treatment, especially in relation to the conditioning of castings in heavier sections and the examination of the metallographic structure affords the most reliable means of evaluating the results of heat treating operations, and fortunately it may be carried out so as to place it in the class of non-destructive tests. It is best adapted by the removal of a small section from a portion of the heaviest part of the casting in such a way as to not affect its usefulness. It is impossible to over-emphasize the importance of this method of inspection for special steel castings.

Although not generally in use, radiographic examination will eventually be recognized as the most valuable nondestructive test for castings, where positive assurance of soundness is essential. Up to the present, it has found its greatest use is the study of foundry problems and the inspection of welds in pressure vessels. Shrinkage cracks and general internal stress may be found in steel castings by the use of the x-ray or gamma ray, and the one condition that is retarding the progress of radiographic inspection is the lack of means for distinguishing between defects and blemishes.

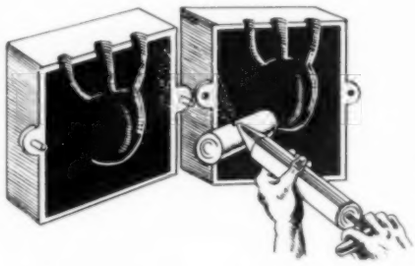
Impact tests are being specified more and more by the purchaser, for reason that the impact test, when properly made gives at least a good idea of the ductility of the metal at critical sections in a casting. Thousands of castings are giving satisfactory service today that have been inspected and made under the old types of specifications, but failures from other than normal causes are of sufficient frequency to point out the necessity for greater uniformity of quality.

Assurance that castings are integrally sound and properly heat treated can only be had by a knowledge of characteristics of the soundness of the casting itself.

Seals Mold Surface Without Flame

By A. H. Waychoff

To cure trouble with molding sand cutting or sloughing on small intricate castings, a well equipped foundry often sprays the mold surface with weak molasses water after the pattern has been drawn and then bakes and seals the surface by playing a flame over it. This method may not be available to experimenters or amateur foundrymen without the proper equipment. Another method which I often have used successfully is better and



Surface of the sand mold is sprayed with sodium silicate

easier than bothering with skin drying.

Take a common fly sprayer and fill it with a mixture of sodium silicate (water glass) and water in equal proportions. After drawing the pattern, spray the mold face lightly with the mixture as shown in the accompanying illustration. It will dry quickly. Spray the face again heavily and let it air dry for about 30 minutes.

The sand will be held tightly and the mold may be closed and poured. The treatment prevents sand cutting by the hot metal and makes a smooth casting with no sand holes. When the face of the mold is perfectly sealed by the mixture, any generated steam is driven out through the backing sand instead of into the molten metal where it would cause cold shuts or blow holes. Amateur foundrymen trying to make castings in any metal—brass aluminum, copper, or iron—will find it easy to get perfect castings. In fact, this shop kink might save the professional foundryman much time and trouble.

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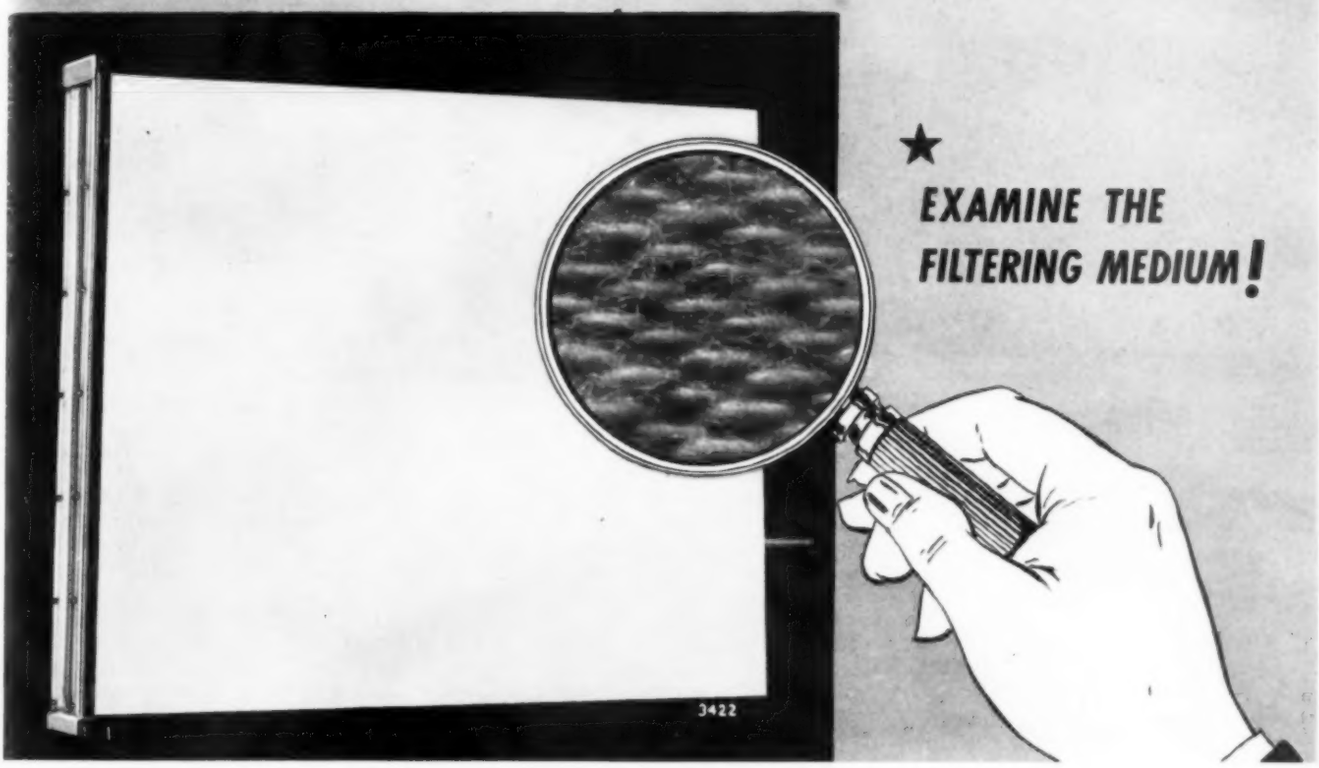

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The collected dust is removed from the bags by a simple shaking device. This shaker jars, beats and flexes the bags over 400 times per minute. On ordinary foundry dust control systems it is only necessary to run the shaker motor at intervals totaling six minutes out of every eight hours of filtering.

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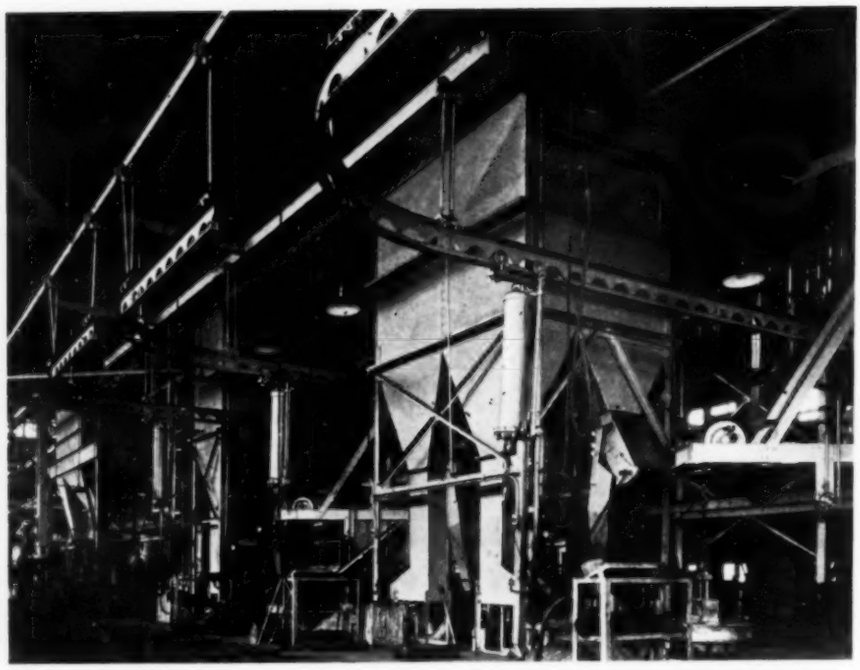


Fig. 5—Prepared molding and facing sands are stored in large hoppers in the vicinity of the molding stations

Chilled Car Wheels

(*Continued from page* 33)

express trains. In 1912 the daily runs from Boston to New York averaged 29 miles per hour including stops which made it necessary to run as high as 50 to 60 miles an hour at times to maintain the average speed. This speed was maintained practically across the continent in fast freight service. For example the regular schedule from Chicago to Denver, a distance of 1000 miles, was 48 hours. At present the time is 32 hours.

Importance of the study of wheel economics cannot be over estimated when the magnitude of the work performed annually is considered. At present about 800,000 carloads of freight are loaded each week on the railroads of America. At this rate the total for the year is 40,000,000 carloads. Each car loaded including the empty movement, is hauled approximately 500 miles making a total of 20 billion car miles. Average weight of the car and load is 35 tons, hence the total amount of work performed by wheels in freight car service is 700 billion gross ton-miles annually. Eighty-five per cent of this work, or about 600 billion gross ton-miles is performed by chilled wheels. Since for the past several years slightly more than 1,000,000 wheels have been supplied, the average life of a chilled wheel may be taken at approximately 600,000 ton miles.

Supremacy of the chilled tread wheel has been secured by a number of economic advantages which have established its enviable reputation. Among these are: Accessibility of wheel foundries to all railroad centers, practically eliminating freight charges on the new product, also on the return scrap wheels; 2—low capital investment in wheels and shop machinery; 3—low storenouse and machining costs; 4—guaranteed minimum service; 5—low first cost on account of the exchange feature by which the worn out wheel is exchanged for an equal tonnage of new wheels; 6—important economics in service arising from superior physical properties:

a—Hardness of tread which gives a maximum of service with minimum loss of metal.

b—The bearing value is unexcelled, hence the heaviest loads can be carried without the least indication of cold rolling or flowing of metal at the surface of the tread.

c—Rotundity is retained on account of absence of ductility.

d—Coefficient of friction between wheel and brake shoe is 20 per cent greater than developed on other types of wheels under the same pressure.

e—Durability of brake shoes when used on chilled tread wheels is from 25 to 100 per cent greater than when used on other wheels, variation depending on the type of shoe.

f—Abrasion between a chilled iron flange and a steel rail is much less than that of a steel flange against a steel rail.

g—That part of train resistance developed through flange friction and tread slippage is materially less in the case of chilled tread wheels than with other wheels.

h—The factor of safety against train derailment is as great, if not greater, than in other types of wheels under similar operating conditions. The chilled tread wheel is the only wheel that has carried a uniform service guarantee furnished by the manufacturer. This guarantee protects the railroads against minimum service of less than 5 years for wheels under 70 ton cars and 7 years minimum service under freight cars of lesser capacity. This guarantee is equal to a minimum service of 300,000 ton miles, a mileage representing about half the

(*Continued on page* 71)

TABLE I

Measure Wheel Wear

(b) Wheel load	(c) Miles	Miles per $\frac{1}{32}$-inch metal worn from tread
1 ton	600,000	120,000
2 tons	300,000	60,000
3 tons	200,000	40,000
4 tons	150,000	30,000
5 tons	120,000	24,000
6 tons	100,000	20,000
7 tons	85,000	17,000
8 tons	75,000	15,000
9 tons	66,000	13,200
10 tons	60,000	12,000

TABLE II

Heat Treat Test Bars

Time of annealing	Temperature Deg. F.	Transverse breaking strength
None	None	16,000 lbs.
24 hours	1400	17,240 lbs.
2 hours	1500	16,800 lbs.
12 hours	1500	18,060 lbs.
18 hours	1500	20,640 lbs.
24 hours	1500	22,190 lbs.
24 hours	1500	26,540 lbs.
6 hours	1600	24,070 lbs.
10 hours	1600	28,370 lbs.
12 hours	1600	30,260 lbs.
24 hours	1600	31,160 lbs.

(*Continued from page* 68)

total estimated life of the wheel. The railroads are reimbursed for any wheels which fail to make their minimum guarantee on account of any manufacturing defect.

New wheels purchased for repairs are paid for by delivering an equal tonnage of old wheels to the manufacturer and paying in addition about one cent a pound, or $20 a ton, for converting the old wheels into new ones.

Wearing value of the chilled tread wheel is well established at approximately 600,000 ton-miles for depth of wear of 5/16-inch, hence, the miles of service which may be expected from a chilled tread wheel with 5/16-inch chilled metal worn from the tread, also the number of miles for each 1/16-inch wear is as shown in Table I.

The chilled tread car wheel has been confined very closely to iron alloyed with 3.40 per cent carbon. In the chilled portion of the wheel the carbon is all combined, whereas in the gray iron portion the combined carbon is 0.90 per cent or less and the graphite 2.50 per cent or more.

Favor High Total Carbon

The reason why the chilled iron wheel industry has stuck so closely to one particular composition is that when melting iron in the cupola, in direct contact with incandescent carbon, a balance of approximately 3.40 per cent total carbon is maintained in the iron, regardless of the carbon content of the metals charged. Furthermore, cast iron of this composition is very fluid, is of comparatively low shrinkage and hence develops the fewest foundry defects. The foundrymen and railroad inspectors therefore are partial to high total carbon on account of the prevention of superficial defects. The machine shop foreman is pleased with high total carbon on account of easy machinability. Consequently 3.35 per cent total carbon until recently has been specified as a minimum in the A.R.A. and A.S.T.M. specifications.

When a wheel is poured the flange and tread are the first to solidify because of the rapid dissipation of heat from the molten metal into the chiller. The plate is next to solidify and by so doing becomes integral with the tread. Lastly the hub freezes and is not free to shrink because it is restrained by the tread and plate. This places the plate in radial tension. If the wheel is allowed to cool in the air the hub will develop a tension in the plate equal to its ultimate strength, in other words the plate will crack under no load. To prevent any such developments in the tread and plate the wheels are placed in annealing pits where the cooling of the tread and plate is arrested and the temperature of the metal in all parts of the wheel become equalized.

To completely remove the internal stresses in the plate the pit temperature at the time of pitting should be about 1200 degrees Fahr. which will insure the metal in the wheel equalizing in temperature at about 1350 degrees Fahr. There is a critical temperature in the cooling curve of wheels which occurs at about 1300 degrees Fahr. It is essential that the wheels should equalize in temperature above that point. It is well known that recent foundry practice, in which the pit temperatures are higher than formerly, has eliminated the service defect of cracked plates and wheels broken from over heating.

Treatment of Wheel Tread

While the pit temperatures have been fairly well understood for a number of years with reference to the plate of the wheel, sufficient attention has not been given to heat treatment of the tread of the wheel.

The first metal to enter the mold, after the back hub has been filled flows to the flange of the wheel and quickly solidifies. Very shortly thereafter the metal of the tread solidifies. Total amount of shrinkage of the chilled metal is ¼-inch per foot, while that of the gray iron is only ⅛-inch per foot. Hence, the circumference of the wheel has a tendency to reduce its length twice as fast as the metal in the plate of the wheel is reducing. This places a circumferential tensile stress in the tread of the wheel which accounts for the tendency toward chill checks in the process of manufacture. Also, because the plate of the wheel resists the shrinkage of the tread at its center, while the outer rim and overhanging flange are not resisted, a bending stress transversely across the tread is produced.

When the wheel is cast the chill in the flange and tread (high shrinkage) is the first metal to solidify, and in so doing contracts to produce a radial compression and circumferential tension in the wheel.

TABLE III

Heat Treatment Increases Strength

	Breaking load at flange, pounds
Average strength of 8-inch chilled tread wheel, cast according to usual foundry practice	60,980
Cooled in air after shaking out——not pitted	62,175
Cooled in air after shakeout, reheated in electric furnace for 24 hours at 1500 deg. F., then cooled in air —average strength	90,435
After shakeout, placed in electric furnace and annealed for 24 hours at 1500 deg. F., average strength	105,515

Since the tread is losing its heat very rapidly to the chiller, it is constantly shrinking and passing through its own critical range considerably before the mottled and gray iron have lost enough heat to enter the critical range. The plate (with one half the shrinkage) is resisting the shrinkage of the tread and introducing a radial compression. Because of the overhang of the flange and rim, their shrinkage

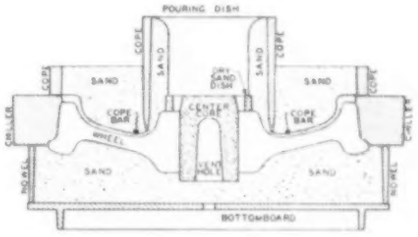


Fig. 6—Sectional view of car wheel mold showing position of pouring basin, center core and chiller

is not restrained by the plate, resulting in transverse tension in the tread caused by the combined bending moments in rim and flange.

Not only does the chilled metal shrink more rapidly than the gray iron but as the plate begins to solidify the graphite is thrown out of solution which is sufficient to not only arrest the shrinkage of the gray iron but actually may produce an expansion for a short period of time. All this is going on while the tread is shrinking rapidly. Effect of these internal stresses is to reduce the resistance of the flange and rim of the wheel to service impacts to the extent that the internal stress exists.

To verify conclusions of the advantages to be gained by heat treatment, laboratory tests were first developed, using transverse test bars 1½ x 2½ x 22½ inches, chilled on the 1½-inch face, broken on 18-inch centers. Ordinary strength of these bars as cast is about 16,000 pounds. Application of heat treatment is shown in Table II.

To demonstrate the value of heat treatment of the chill tread wheel, tests were made in the laboratory with 8-inch chilled tread wheels in which the wheels could be cast at the cupola and subjected to heat treatment in the laboratory, or they could be cast in the laboratory from metal melted in an induction furnace and immediately subjected to heat treatment after being shaken out.

The wheels were tested in a testing machine where the flange of the wheel was supported at three equidistant points and the load applied to the back hub. After the applied load was sufficient to break a flange the wheel was rotated so that the

broken portion could be moved away between two supports and the load again applied until a second piece of the flange was broken off. Results of these tests are shown in Table III.

These tests indicated the possibility of increasing flange strength 50 per cent or more by proper heat treatment. Maximum temperature and time of application must be such that there will be no break down of the chilled metal into graphite. The relation between time and temperature in connection with the breaking down of cementite into ferrite and graphite was established several years ago by a research of the association of manufacturers of chilled car wheels, conducted at the bureau of standards, Washington.

To determine the means by which these results can be obtained in regular foundry practice the association of manufacturers of chilled car wheels appropriated $25,000 for the construction of a heat treating unit in which the temperature can be maintained at any desired degree by oil burners. This furnace has been completed and is in successful operation. In has been demonstrated that regardless of the depth of chill, a 700-pound wheel will not fail in the thermal test in which a 3-inch band of iron is used and the time unlimited. Each of the eight compartments contains 20 wheels, or a total of 160 in the group. The temperatures of the furnace is maintained above 1300 degrees Fahr., continuously. Maximum variation through the group is about 100 degrees Fahr.

Effect of heat treatment on the chilled iron is to change the familiar lamellar pearlite into spheroidized pearlite.

This is the second of three articles on the Griffin Wheel Co. The third will appear in an early issue.

THE EDITORS

Form Supply Firm

Wolverine Foundry Supply Co., 3237 Bellevue avenue, Detroit, recently has been formed by George A. Burman, August J. Becker and Charles D. Yahne. The company will handle facings, core binders, liquid core compounds, machinery and equipment.

American Refractories institute, Pittsburgh, has published a technical bulletin entitled, "Refractory Mortars, Coating and Ramming Materials for the Foundry," by L. C. Hewitt, which discusses applications and methods of handling refractory mortars and coatings in the foundry. Copies of the bulletin may be secured from S. M. Phelps, Mellon institute, Pittsburgh.

Technical Program At Ann Arbor

Several changes and additions have been made in the program of the second fall technical conference of the American Foundrymen's association to be held in co-operation with the University of Michigan, Ann Arbor, Mich., and the Detroit chapter of A. F. A. Program of the conference, to be held in Ann Arbor on Sept. 15, 16 and 17, is as follows:

Thursday, Sept. 15

MORNING

Malleable Iron Technical Session

Registration.
Chairman, Homer Wright, Michigan Malleable Iron Co., Detroit.
Subject, Annealing Methods:
Annealing, by J. H. Lansing, Malleable Founders' society, Cleveland.
Controlled Atmospheres, by John A. Dow, Holcroft & Co., Detroit.
Discussion.

AFTERNOON

Nonferrous Technical Session

Chairman, E. R. Darby, Federal-Mogul Corp., Detroit.
Subject, Age Hardening:
A description of the Age Hardening Process as Applied to Castings, by L. W. Kempf, Aluminum Co. of America, Cleveland.
High Conductivity, Age Hardening, Copper-Chromium Alloys, by Dr. A. B. Kinzel, Union Carbide & Carbon Research Laboratories, New York.
Discussion.

Friday, Sept. 16

MORNING

Cast Iron Technical Session

Chairman, V. A. Crosby, Climax Molybdenum Co., Detroit.
Transformation Rates of Austenite in Cast Iron, by Prof. W. P. Wood, Dr. D. W. Murphy and C. D. D'Amico, University of Michigan, Ann Arbor, Mich.
Effect of Under-Cooling on the Nature of the Graphite Pattern in Gray Cast Irons, by Prof. R. Schneidewind and C. D. D'Amico, University of Michigan, Ann Arbor, Mich.
Discussion.

AFTERNOON

Cast Steel Technical Session

Chairman, F. A. Melmoth, Detroit Steel Castings Co., Detroit.
Highly Alloyed Heat and Scale Resistant Steel Castings, by James Corfield, Michigan Steel Castings Co., Detroit.
Cast Steels in Automotive Work, by R. H. McCarroll, chief metallurgist, Ford Motor Co., Detroit.
Spectrograph as a Foundry Tool, by A. M. Sampson, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.
Discussion.

EVENING

Conference Dinner

Speaker, W. J. Cameron, Ford Motor Co., Detroit.

Saturday, Sept. 11

MORNING

Gray Iron Technical Session

Chairman, A. L. Boegehold, General Motors Research Corp., Detroit.
Vice Chairman, Fred J. Walls, International Nickel Co., Detroit.
Some Factors Affecting Properties of Superheated Cast Iron, by Dr. C. H. Lorig, Battelle Memorial institute, Columbus, O.
Influence of Composition on the Properties of Electric Furnace Irons, by Robert G. McElwee, Vanadium Corp. of America, Detroit.
Discussion.

Adventures of Bill

(*Concluded from page* 50)

pale green light shone steadily above. The wheels hammered on the crossing. Thicker and thicker like colored fire flies the switch lights tangled in a maze. We were entering the city. There was the constant rattle of switch points and I felt the growing murmur of streets. On either side buildings piled up in shapeless walls like a canyon. There were sudden glimpses of interrupted streets, waiting street cars and the glare of arc lights. We were slowing down.

Cleveland. The station echoed with the iron coughing of engines. Men and women surged between waiting trains. Their voices mingled in the uproar. The departing, the returning; men staggering with bags and suit cases; women with little children in their arms. In the green star they trusted.

"There y'are," said Bill. "As fine a bit of the King's English as ever I threw an eye over. I'd like to shake honest Joe by the hand. I'm kind of partial to green myself!"

Establish Chapter

(*Concluded from page* 53)

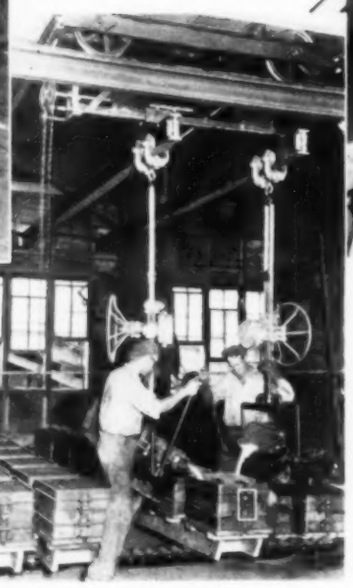
affiliation with the Chicago chapter of the American Foundrymen's association was attended to by the following committee appointed by Harold W. Johnson, then chairman of the Chicago chapter: A. W. Gregg, Whiting Corp., chairman; A. Gleason, Carnegie-Illinois Steel Co.; Norman F. Hindle, American Foundrymen's association; Charles C. Kawin, Chas. C. Kawin Co.; F. B. Skeates, Link-Belt Co.; W. R. Parker, American Steel Foundries; V. G. Cornelius, Carnegie-Illinois Steel Co.; Harold W. Johnson, Greenlees Foundry Co.; R. W. Schroeder, Crane Technical high school.

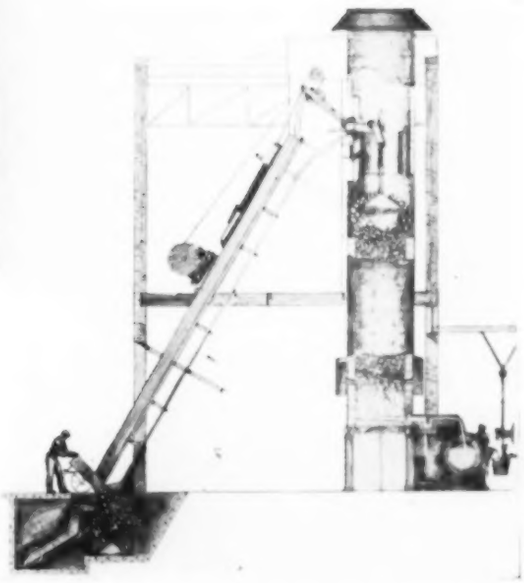
Division of simplified practice, bureau of standards, Washington, has made available mimeographed copies of the revised recommendation R154-34 on cupola refractories. The revision adds ten sizes of 6-inch blocks for diameters larger than those previously listed, a new schedule of twenty 9-inch blocks for outside diameters from 66 to 141 inches, and eight 9-inch high blocks for outside diameters from 25 to 82 inches.

APPLY *Modern* EQUIPMENT *in your foundry!*

Patents Applied For

MODERN Enclosed Elongated Mixing Ladles produce uniformity of metal and permit metal refining in the ladle. Metal temperatures maintained three times as long as in open mixing ladles.





MODERN Covered and Insulated Ladles enable handling larger amounts of metal with less heat loss.

The MODERN RICHARDSON Cupola Charger reduces charging and melting costs to a minimum.

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MODERN EQUIPMENT CO.

Melting Copper Base Alloys

(*Concluded from page 34*)

In producing red brass alloys, exemplified by such mixtures as 85 per cent copper, 5 per cent tin, 5 per cent lead, 5 per cent zinc, the copper is melted first and preferably deoxidized with some of the zinc. The tin and lead then are added and the bath stirred well before the remainder of the zinc is stirred in. Careful analytical control of such alloys will show that there is a definite loss of zinc in the deoxidizing process. Where the zinc content is important, the loss must be compensated for by the addition of zinc in excess of the desired zinc content of the alloy. In the case of such alloys as 77 per cent copper, 3 per cent tin, 10 per cent lead and 10 per cent zinc, the zinc content is sufficient to indicate definitely an appreciable loss due to oxidation. Therefore, something more than 10 per cent of zinc is necessary to be added to the alloy so that the final product will have the correct analysis.

Some manufacturers find it desirable to deoxidize the copper with another deoxidizing agent before adding any of the white metals, as for example, phosphorus in the form of phosphor tin or, more commonly, phosphor copper. Manganese in the form of manganese copper also is used.

Copper Contains Oxygen

In general, it is to be remembered that the copper itself, as it arrives at the foundry in the form of ingot, has a definite oxygen content in the form of dissolved copper oxides. This is done to produce an ingot of good appearance and free from shrinkage cavities that would disfigure the ingots and make them unsightly in appearance. Consequently the bath of molten copper will contain oxygen even though the melting conditions in the foundry were such that no oxidation took place during the melting of the ingot copper.

This oxygen is combined with copper in the form of copper oxide and is dissolved in the molten copper bath. When any other metal that has a strong affinity for oxygen is added to this molten copper, some of the copper oxide is reduced and that oxygen is free to combine with the metal just added, forming an oxide of that metal which may float to the surface and be skimmed off or may become entangled in the bath and later form what might be termed a microscopical slag spot.

If phosphorus is added to the molten copper, the phosphorus, combined with the oxygen, reduces the copper oxide to copper and forms an oxide of phosphorus, which usually passes to the surface and thus is eliminated. The problem becomes one of adding just the right amount of phosphorus to deoxidize exactly the copper and yet have no excess to provide phosphorus in the resulting alloy when the specifications for the alloy do not permit any phosphorus.

Since the percentage of oxygen in the bath varies, the exact amount of phosphorus necessary to deoxidize completely the copper must vary. Therefore, the usual practice is to add a very small amount of phosphorus in the form of phosphor copper or phosphor tin. After stirring this in, follow the practice as previously described, relying upon the phosphorus for the major part of deoxidation and the first addition of zinc for the final deoxidation.

May Use Manganese

Where manganese is used as a deoxidizer, it definitely forms a compound of manganese oxide which floats to the surface and is skimmed off. The author has heard competent metallurgists speak of this manganese oxide as the *kish* produced by the addition of manganese, just as the addition of manganese to molten iron and steels produces a definite kish. One manufacturer considers it good practice to add manganese to the molten copper in small quantities, stirring each addition thoroughly. When no more kish rises to the surface, the copper is considered thoroughly deoxidized and the white metals, zinc, tin and lead, are then added to produce the alloy desired.

Red brass alloys commonly are used for valves and other parts which are subjected to water pressure of hydrostatic tests. Consequently, they must be extremely sound to resist leakage under such tests. A well deoxidized alloy of these red brasses will be sounder than one that is poorly made. Presence of some impurities is disastrous to the nonleakage quality. Aluminum is recognized as an element that should not be present in these brasses if they are to resist leakage under pressure. Therefore, in the production of these alloys, it should be borne in mind that the raw materials that may contain aluminum should not be a part of the materials to produce castings that are to meet such requirements.

A wide variety of other alloys are produced in nonferrous foundries, such as silicon bronzes, white brasses containing appreciable percentages of nickel, zinc base alloys and the aluminum base alloys of which there are a myriad. Production procedure in each has been worked out scientifically by manufacturers who devote themselves exclusively to the production of one or more of these types. In the production of the common nonferrous alloy castings, there are certain general precautions that apply to all and certain rules that are helpful in the production process.

The author frequently has emphasized the importance of preventing heated nonferrous metals from coming in contact with under burnt gases and cannot urge too strongly the importance of unremitting care to protect melting metals from gas absorption by eliminating from the atmosphere in which the melting metal is exposed all gases that are capable of absorption. The only method for this is to oxidize them completely. Do not superheat molten metal beyond the pouring temperature. Melt all the charges as rapidly as possible. Pour the metal as soon as it has reached the temperature desired and do not keep the metal soaking in the furnace until some more molds can be produced.

Uniformity of product demands uniformity of practice. Uniformly accurate analysis requires frequent check of the different metals added to make up the charge. Regular analysis quickly will show whether the correct allowance has been made for loss in oxidation or vaporization and without this regular analysis, it is impossible to be certain of uniformity of product which modern conditions demand.

Offers Courses

Stevens Institute of Technology, Hoboken, N. J., is offering for the first time during the academic year 1938-1939 a program of evening graduate courses for engineers. Coordinated groups of related courses are offered in the fields of mechanical engineering, electrical engineering, and economics of engineering. First sessions of the new evening school will be held during the week of Sept. 26, 1938.

United States department of labor, division of labor standards, recently has published a bulletin "Discussion of Industrial Accidents and Diseases" which contains the report of the 1937 convention of the International Association of Industrial Accidents Boards and Commissions, held at York Harbor, Me. The bulletin may be purchased from the superintendent of documents, Washington, for 25 cents.

OBITUARY

GEORGE R. RAYNER, 67, executive vice president, Carborundum Co., Niagara Falls, N. Y., died at Lewiston Heights Aug. 15, after a long illness. He had been connected with the Carborundum Co. since 1898 when he came to Niagara Falls as secretary and general sales manager. Shortly after the World war he was elected vice president, which position he held until his death.

* * *

Benjamin W. Brown, 55, recently retired president and treasurer, Albion Malleable Iron Co., Albion, Mich., died in that city on Aug. 7.

* * *

George J. Black, general purchasing agent, Standard Sanitary Mfg. Co., Pittsburgh, died recently in that city.

* * *

Col. William A. Smethurst, 65, an official of the Baldwin Locomotive Works, Philadelphia, died in New York on Aug. 12, after five months illness.

* * *

Henry Kramer, 83, president and treasurer, H. Kramer & Co., Chicago, died in his home, Chicago, Aug. 11. Mr. Kramer founded H. Kramer & Son in 1888, and in 1904 the company was incorporated with Mr. Kramer as president.

* * *

Bert A. Mick, 67, former sales manager and consulting engineer, Hubbard Steel Foundry Co., Chicago, died recently at his home in Pittsburgh. Mr. Mick also was associated for many years with the Mesta Machine Co., Pittsburgh.

* * *

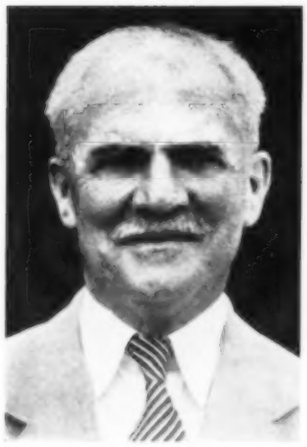
Henry Laidlaw, special representative, Worthington Pump & Machinery Corp., Harrison, N. J., died recently in Kingsville, Ont. Mr. Laidlaw long had been associated with the Worthington organization, and had been appointed special representative in 1927.

* * *

R. B. Fremont, president New Deal Foundry Co., Oklahoma City, Okla., died recently in that city. He had opened the New Deal foundry about three months ago after closing a former shop, the Fremont Foundry & Bearing Works, Oklahoma City, Okla.

* * *

Anthony Carlin, president and treasurer, Anthony Carlin Co., Cleveland, died in that city on Aug. 20 at the age of 81. He was born in Donegal, Ireland, and came to Cleveland as a youth in 1872. After learning the molder's trade he organized the Standard Foundry & Mfg. Co. in 1887. In 1918 the Anthony Carlin Co. comprising a rivet manufacturing concern and real estate properties was incorporated.



George R. Rayner

* * *

Charles Wetherbee, 67, former vice president and superintendent engineer of the old Bath Iron Works Ltd., Bath, Maine, died on Aug. 10. Following graduation from Massachusetts Institute of Technology in 1891 and from Ecole d'Application du Geni Maritime of Paris in 1894, he was associated with the Newport News Shipbuilding & Drydock Co. and the Columbian Iron Works, Baltimore. Until his retirement two years ago he was consulting engineer for Westinghouse Electric & Mfg. Co. and the shipyard division of Bethlehem Steel Co.

Stove Lid's Life Is Extended Greatly

Use of chromium to confer resistance to oxidation on steel and iron is well known to metallurgists and engineers in industries having numerous high-temperature operations. Chromium acts as a protector against the effects of hot gases. At high temperatures a tough and strongly adherent protective coating of chromium oxide forms on steels containing appreciable amounts of this alloying element.

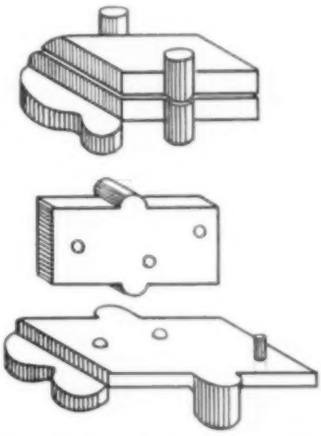
While the use of high-chromium steels and irons is common in industry, domestic applications are rather unusual. Four years ago, two sets of covers and lids of high-chromium castings were installed on the cooking range of a plant cafeteria. These castings contained approximately 25 per cent chromium, small amounts of nickel, and about 0.5 per cent carbon.

The range was fired with anthracite coal, and the top was usually at a dull red heat. Ordinary cast iron covers and lids failed in about 4 months from oxidation and warping. The high-chromium castings which were made to replace them, were installed early in 1933. Recently, they were examined and found to be in good condition after 4 years of continuous operation. They had not cracked or warped and were not oxidized. It is estimated that under present conditions of use they will last indefinitely.

Locate Dowel Holes In Patterns

By A. H. Waychoff

A simple method for locating matching dowel holes in a split pattern is shown in the accompanying illustration. In some instances it is impractical to bore holes completely through either half of a pattern. To locate the holes accurately by measurement involves considerable time. In the method shown, one half of the pattern is placed on the bench with the joint side up. After deciding on the number and position of the required dowel holes, a small steel ball is placed at each position as shown, and lightly tapped with a hammer to form a seat. The second half of the pattern then is placed in proper position and pressed or rapped down on the balls so that an impression of each ball is formed in the joint surface. With the lower and upper indentations for a guide the dowel holes readily may be bored or drilled either in a wood or metal pattern.



Small steel balls are used to mark the position of the dowel holes

Book Review

Foundry Sands, by T. R. Walker; cloth; 134 pages 5 x 7½ inches, published by Charles Griffin & Co., Ltd., London. Supplied by THE FOUNDRY, Cleveland, and in England by the Penton Publishing Co., Ltd., London.

This book, one of a series of industrial text books, deals with the general subject of foundry sand and more particularly with sands used in British steel foundry practice. A

great deal of the experimental work on which the text is based was carried out in the laboratories of the English Steel Corp., Ltd., Sheffield, where the author is chief chemist and technologist.

Forty one tables, 22 illustrations and a two-page index add considerably to the value of the work as a reference for steel foundrymen and particularly for metallurgical or foundry students reading for examination. In orderly sequence the subject is presented under the following 10 chapter headings: Origin of sands and clays, Important properties of foundry sands. Characteristics of sand grains and clays, Sand testing, (two chapters). Application of sand testing. Sands for dry sand molding. Sand and clays for green sand molding. Core sands and mixtures. Preparation and handling of sand.

He Has the Papers To Prove It

LACKING any proof or claim by other possible claimants for the honor, Edward G. Borgnis, for the past 21 years representative of the International Molding Machine Co., Chicago, lays claim to the distinction of being the oldest indentured apprentice in the state of Wisconsin. Long before an industrial commission was set up in Madison to regulate the hours of work and the rate of pay, Ed became a duly indentured apprentice in the pattern shop of the Weisel & Vilter Mfg. Co., Milwaukee. The date? Nov. 29, 1887.

At that time he was 18 years of age and already had been on the firing line for four years, first as a cabin boy on the revenue cutter ANDREW JOHNSON and then in a machine shop where he received the munificent remuneration of $1.75 for a 10-hour, six day week. A young man can't do much in a social way on $1.75 per week after deducting the irreducible necessary amounts for food, shelter and clothing. He signed up with Weisel & Vilter Mfg. Co., for a period of 4 years. In consideration of faithful and undivided service on his part the firm covenanted and agreed to pay him $3.00 per week the first year, $4.00 per week the second year, $5.00 the third year and the truly handsome sum of $6.00 per week in the fourth and concluding year. If he complied with certain conditions he was promised a bonus, to wit:

Should the service of the said Edward Borgnis in the 4th year of his apprenticeship be of sufficient value to the said Weisel & Vilter Mfg. Co., they may raise his last years pay to $7.00 per week. If the said Edward Borgnis has faithfully served during his four (4) years apprenticeship, the said Weisel & Vilter Mfg. Co., agree to pay him for the 3rd and 4th year, at the end of his term the amount of $1.00 per week of sixty (60) working hours in addition to the wages paid.

Ed stayed and collected the pay and the bonus. At a recent meeting of the Milwaukee Chapter of the American Foundrymen's association he passed around the aged and yellowed copy of the indenture form and outlined his early experience as an apprentice. At the noon hour each day he collected one long stick with 10 notches in it, 10 tin cans and 10 nickels. The nickels were to buy beer, the cans were to hold the beer and the notched stick was to carry the cans that held the beer that was bought for the nickels. Fortunately the nearest saloon was within a figurative stone's throw and a smart little apprentice usually could make two round trips before the 1 o'clock whistle set the wheels of industry whirling again.

Edward G. Borgnis

After serving his apprenticeship according to every jot and tittle of the agreement, Ed worked for various periods as a journeyman patternmaker in several Milwaukee plants, two years for Pawling & Harnischfeger Co.; 7 years for Filer & Stowell; three years for Kempsmith and 16 for the Falk Corp. Fund of knowledge gained in this period has been a decided asset during the past 21 years in selling, setting up and showing foundrymen how to get maximum production out of his molding machines.

Members of the present generation will be interested to learn that the term indenture is a legal term, that in common with many other legal terms, hoary with age and tradition, no longer is used in the original sense. The term, synonymous with contract, originated with the ancient practice of providing each party to a contract with an authentic copy thereof. Terms of the contract were written twice on the same sheet of paper or parchment, which then was torn irregularly so that each party had a copy. Authenticity of the copy held by each then could be established by matching the halves at the torn edges, or indentations.

In the present instance the indenture written in beautiful flowing script and headed *Agreement, The Weisel & Vilter Manufacturing Co., & Edward Borgnis* sets forth:

Agreement entered into this 29th day of November in the year 1887 between The Weisel & Vilter Mfg. Co., of the city and county of Milwaukee, State of Wisconsin, parties of the first part, and Edward Borgnis and Edward E. Borgnis of the same place, parties of the second part.

Witnesseth: The said Edward Borgnis enters on the 29th day of November, 1887 into the employ of the said The Weisel & Vilter Mfg. Co., as apprentice for the term of four (4) years to learn the patternmaking trade and agrees to devote all his time during business hours to the interest of the said The Weisel & Vilter Mfg. Co., and to do the work entrusted to him, and to perform faithfully what may be asked of him as such apprentice. The said The Weisel & Vilter Mfg. Co., besides giving the said Edward Borgnis all possible chance to learn the trade as patternmaker, agrees to pay him in the first year $3.00 per week of sixty (60) working hours; in the second year $4.00 per week; in the third year $5.00 per week; and in the fourth year $6.00 per week. Should the service of the said Edward Borgnis in the 4th year of his apprenticeship be of sufficient value to the said The Weisel & Vilter Mfg. Co., they may raise his last year's pay to $7.00 per week.

If the said Edward Borgnis has faithfully served during his four (4) years apprenticeship the said The Weisel & Vilter Mfg. Co., agree to pay him for the 3rd and 4th year at the end of his term the amount of $1.00 per week of sixty (60) working hours in addition to the wages paid.

The said Edward Borgnis agrees to stay the full term of four (4) years in the employ of said The Weisel & Vilter Mfg. Co., and to conduct himself in such manner as to gain their satisfaction.

The said Edward E. Borgnis, the father of the aforenamed Edward Borgnis agrees that the aforesaid conditions on the part of his son shall be faithfully carried out. In witness whereof the parties to this agreement have signed the same the day and year first above written.

YOU SAVE $1 TO $5 A TON WITH *Globe Silvery*

Road Machinery Builder Reduces Losses 80%

One of the largest builders of road machinery in the world was suffering losses on road scraper castings due to porosity which could not be discovered until after machining and a pressure test was applied. An introduction of a regular quantity of Globe Silvery Iron into the foundry mixture reduced losses 80%, and the new mixture actually cost less than before!

Many Advantages Secured With Globe Silvery Iron

1

Silicon content is sufficiently concentrated for proper deoxidation.

2

Low carbon allows better control of grain size. Less graphite segregation.

3

Uniform hardness throughout the casting without complication in cupola practice.

4

Flexibility in mixture for various grades of work without large inventories.

5

Gives freedom from alloy complications due to alloys building up in scrap, and no alloy price extras.

USERS of Globe Silvery Iron are saving from $1.00 to $5.00 per ton of iron produced. *Reason:* a cupola mixture based on Globe Silvery Pig Iron permits the use of low price scrap without sacrifice of quality of iron at the spout.

When you use Globe Silvery as a regular part of a properly designed charge, you can meet specifications at the lowest possible cost whether your castings weigh one pound or one ounce—whether they must be of high tensile strength for hard service, or soft and easily machinable.

Silvery users who take full advantage of the improvements possible by the use of Globe Iron (and their number is increasing) find less iron going to the scrap heap and more iron being shipped out in quality castings.

We invite your inquiries. There is a Globe representative near you—he will welcome the opportunity to study your problems and make suggestions.

NUMBER 4 OF A SERIES

GLOBE IRON COMPANY
JACKSON, OHIO

NEW YORK — BOSTON — PHILADELPHIA — CLEVELAND — DETROIT — CHICAGO — ST. LOUIS — ERIE — CINCINNATI

NEW EQUIPMENT and SUPPLIES

Respirator

American Optical Co., Southbridge, Mass., has announced a new type respirator designed for protection against type-A dusts. The respirator is claimed to provide as much comfort as possible so that workers will not object to wearing

The unit is designed with 42 square inches of filter area

it. Filter area has 42 square inches and the respirator is said to be light weight, not to obstruct vision, require no facial adjustment and to have improved valves for inhalation and exhalation.

Rotary Blowers

Rotary blowers built by the Roots-Connersville Blower Corp., Connersville, Ind., for use with commercial and industrial oil burners are being offered in self contained units with fuel oil pumps mounted in the blower housings and coupled directly to the blower shafts, so that only one motor or power source is required for a unit. Although blowers commonly are used with direct connected electric motor drives, the same blower-oil pump arrangement is available for gasoline engine drives, or flat or multi-v-belt drives. These rotary positive blowers are built for air volumes ranging up from 5 to 700 cubic feet per minute and for pressures of 8 ounces to 7 or 8 pounds per square inch. Other styles are produced for larger air volumes and higher pressures. Oil pumps are supplied in the type and size suitable for the amount and kind of oil used by the burner.

Gas Electric Power

Ready-Power Co., 3826 Grand River avenue, Detroit, recently has put on the market a new gasoline-electric power unit for industrial trucks. The engine is a new Continental motor, new accessory equipment for which includes a dual belt-driven fan and water pump, enclosed magneto drive assembly, low pressure oil filter and an air cleaner. With voltage of 36, 48 or 60 this power unit is designed for 2 to 5 ton trucks.

Push Button Units

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has introduced a line of heavy duty push button stations made of heavy cast iron and designed for protection against fumes, dust and moisture and for use on high control currents of magnetic controllers for large motors. The product is made of rust-resisting materials and the cover is sealed with cork gasket and oil treated paper. Stations of one to four units are available.

Wire Forming

Economy Tool & Machine Co., 10 West Delano, Muskegon Heights, Mich., recently has developed a machine shown in the accompanying illustration for cutting and forming core wires. Wire is taken from the coil, straightened, fed the desired length, cut off and formed to the shape required, at the rate, it is claimed, of 180 pieces per minute. Feeding rolls are serrated so that

Machine automatically draws wire from the coil, cuts it to length and imparts any desired shape

sand will grip the core wires more firmly. The machine is driven by a ½-horsepower geared head motor for 60 cycle, single phase, 110-volt current. The fly wheel is driven by a v-belt. Wire from No. 18 to No. 10 gage is handled in lengths up to 12 inches. A somewhat similar but larger machine handles wires up to 24 inches in length.

MILWAUKEE MOLDERS

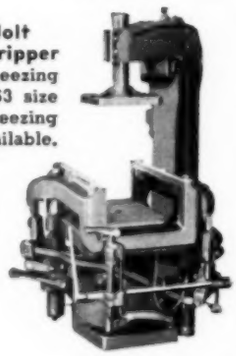
Complete Line . . . . All Types and Sizes

No. 103 Jolt Squeezer, stationary type with 10"squeezing piston. No. 104 portable type, also available.

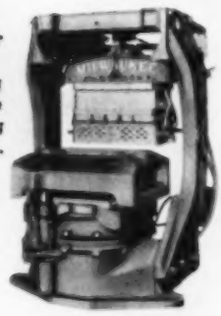
No. 124 Jolt Squeezer, portable type with 12"squeezing piston. No. 123 stationary type, also available.

No. 131 Jolt Squeezer, with 13" squeezing piston. No. 181 size with 18" squeezing piston, also available.

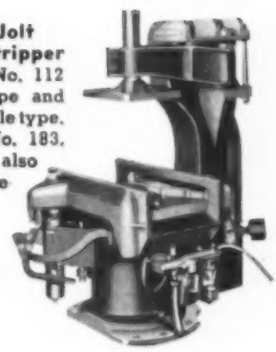
No. 143 Jolt Squeezing Stripper with 14" squeezing piston. No. 163 size with 16" squeezing piston, also available.



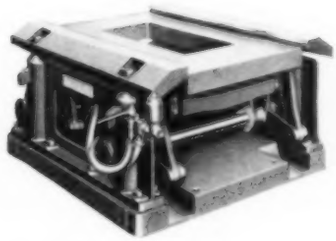
No. 214 Jolt Squeezing Stripper Mold Lift-Off with 21" squeezing piston. No. 244 size with 24" squeezing piston, also available.



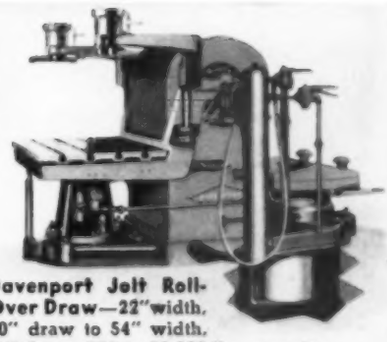
No. 142 Jolt Squeezing Stripper 14" piston. No. 112 stationary type and No. 113 portable type. 11" piston. No. 183, 18" piston, also available



No. 70 Core Grinder with 30" grinding wheel and 70" table. Speed of table, 2 to 5 r. p. m.



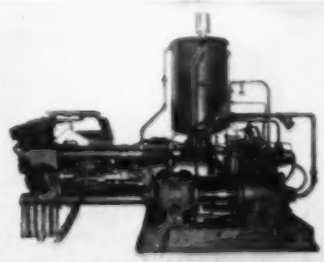
Power Strippers — 20" wide x 40" long to 50" wide x 72" long. 6" to 14" pattern draw.



Davenport Jolt Roll-Over Draw—22"width, 10" draw to 54" width, 24" draw. 750 to 10,000 lbs. capacity.

Every Milwaukee Molder is a fast, high production unit, easy to operate and ruggedly constructed for years of hard service. They enable you to produce quality castings at low cost.

Ask for descriptive literature. No obligation, of course.



No. 330 Briquetting Press — briquettes cast iron borings and crushed steel turnings. Capacity 2 to 3 tons per hour. Automatic hydraulic operation.

Davenport Plain Jolts

12"x12" to 72"x96" tables, 200 lbs. to 16,000 lbs. lifting capacity.

MILWAUKEE FOUNDRY EQUIPMENT CO.

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A 2140-1P (1237)

Roller Conveyor

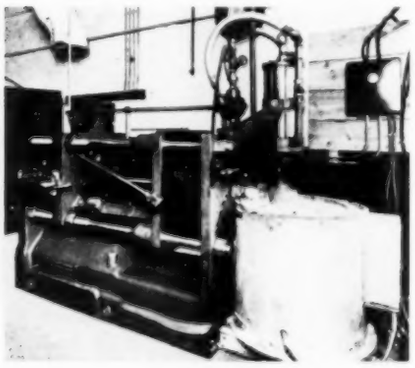
Standard Conveyor Co., North St. Paul, Minn., has developed an impact absorbing roller conveyor to remove the loading shocks from the roller bearings and shafts. Each roller assembly is mounted in a set of steel arms pivoting on a shaft extending through the arms and frame. There are two coil springs, one for each arm. The springs are attached at one end to the arm through the shaft and at the other end to a shaft on the set of arms supporting the next roller assembly.

Excess loads and loading shocks are absorbed by coil springs

When the load carried on each roller assembly exceeds the rated capacity for which the assembly is set, the excess load is transmitted to the coil springs. As soon as this excess load is absorbed from the first shock, the coil springs return the rollers to normal carrying level. Long life is claimed for the bearings and rollers because of the elimination of direct impact and shock.

Melting Furnace

Detroit Electric Furnace Co., Detroit, has placed on the market an induction type electric melting pot furnace for low melting point metals and alloys. Although designed as an auxiliary unit for use in conjunction with die-casting equipment, it is claimed that the furnace also may be used as an independent melting unit for zinc and zinc-base alloys. It is insulated well so that working conditions and surrounding temperature near the furnace are improved materially over older methods. The furnace is equipped with suitable controls to provide automatic regulation of power input and metal temperature. Nominal holding capacities of furnaces are from 700 to 2500 pounds, and melting speeds are from 500 to 800 pounds per hour. Electrical supply required is 230 volts, 60 cycle, single phase with maximum rating of 75 kilovolt-amperes.



The furnace is equipped with suitable controls to provide automatic regulation

Piston Rings

Wilkening Mfg. Co., Philadelphia, has developed a piston ring for compressors, pumps and oil and gas engines which is said to provide a positive and permanent seal at the gap or cut of the ring. The design and construction of the cut or gap provides extra strength, and there are no thin cross sections and no fragile tip to break. The ring is made in various sizes and is heat-shaped to insure roundness or equal distribution of radial pressure around the circumference of the ring. The process also provides a black iron oxide coating on the ring. The ring also may be obtained with a special finish which is said to provide quicker seating, and eliminate scuffing of cylinder walls during the wearing-in period.

Hobby Foundry

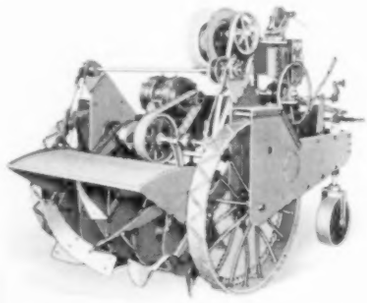
Complete miniature foundry equipment in three sizes either for use as a hobby or for commercial purpose has been placed on the market by the Kansas City Specialties Co., P. O. Box 6022 Kansas City, Mo. The outfit includes a gas furnace, several crucibles, tongs, flasks, graphite, molding sand, furnace lids, parting dust and instructions for use. It is stated the furnace may be operated on natural gas, coal gas, water gas, butane, propane or acetylene. Air is supplied by a high speed universal blower which may be adapted to operate on 110 volt 60 cycle, 50 cycle, 25 cycle or direct current.

Crucibles for the smallest size has a capacity of 6 cubic inches, suitable for pouring castings up to 1½ pounds in weight. The second size has twice the capacity of the first, while the third and largest size has a capacity of 24 cubic inches. It is claimed that the largest furnace starting cold will melt a full 6-pound crucible of bronze in less than 40 minutes, or the same amount of aluminum in 6 minutes. These furnaces are furnished in three sizes, with many accessories.

Cuts Molding Sand

American Foundry Equipment Co., 555 South Byrkit street, Mishawaka, Ind., has designed a small size, simplified sand cutter for use on light to medium floors. It is made in two standard sizes with cutting cylinders or 45 and 50 inches in length. The maximum clearance over the sand is 26 inches. The width overall for each machine is 68½ and 73½ inches respectively, and the height overall is 81 inches.

Two motors provide power for all operations. One motor operates the cutting cylinder and electric cable reel, and the other operates the ground travel drive. Cutting cylinder is elevated and lowered by a hand operated cable hoist. A hand lever is provided for steering, and an equalizer is said to provide complete flexibility to the frame. Electric controls are located convenient to the operator. A high-pressure grease system provides complete lubrication. Safety guards are used wherever necessary.



Small size, simplified sand cutter is designed for light and medium floors

Fork Truck

Elwell-Parker Electric Co., Cleveland, has announced a new tiering, tilting, telescoping fork truck with rated capacities up to 5000 pounds. It has four speeds forward and four reverse. The power circuit is closed and broken by a mill type magnetic

(*Continued on page* 84)

Fork truck designed to travel over uneven floors without transmitting strains to mechanism

Melting Iron in the Cupola

by

J. E. Hurst

CHAPTERS

1—Historical
2—Construction
3—Operation
4—Charging
5—Receivers
6—Combustion
7—Tuyeres
8—Specials
9—Blowers
10—Linings
11—Briquets

Cross Index Listing over 1,000 Items, 240 Pages, 6″ x 9″—126 Illustrations

THIS book covers practically every phase of cupola construction, operation, etc. It is written and illustrated in a manner that will appeal to every foundryman whose work from any angle brings him into contact with the oldest, most convenient and most economical device known for melting iron in the foundry.

The author is recognized as one of the world's foremost authorities on melting by the cupola method. He is a well-known British foundry metallurgist, author of "Metallurgy of Cast Iron" and many papers on individual phases of the same subject. In this, his latest book, Mr. Hurst gives you the net result of his many years of research and practical experience.

Each subject is treated in a thoroughly informative manner to the extent of approximately 20 pages. Original work on the part of the author has been supplemented by an exhaustive investigation of the work carried on by other practical and scientific foundrymen in this field.

Their theories and findings have been incorporated in the text. The book will meet the requirements of the novice who is making his first acquaintance with the foundry cupola. It will serve as a text book for those who desire to teach cupola melting theory and practice to others. To those who already are familiar with the subject, the book will prove an invaluable reference with its wealth of illustrations, tables, formulas and other statistical data.

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Enclosed is **$3.00** for which send me a copy of "Melting Iron in the Cupola" by J. E. Hurst.

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211 I.F.

Originally built for hand operation, this unit required 56 man hours for loading, weighing, and moving 1500 pound charging buckets into the cupola charger.

As production increased, a bucket had to be in position every 90 seconds. Track was extended to cover additional storage area, and an American MonoTractor was added for propelling the unit along the track.

Now, only 24 man hours are necessary to deliver this greater tonnage, reducing the cost of handling by 58%.

THE AMERICAN MONOTRACTOR

This rubber-wheel drive unit offers similar low cost operation of carriers, hoists or cranes on any smooth flange monorail system.

Write for 24 page book describing the American Mono-Tractor. Send inquiry to the American MonoRail Company, 13104 Athens Ave. Cleveland, Ohio

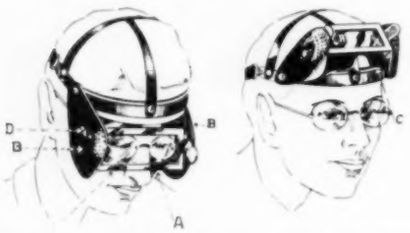
for PLANNED HANDLING
call an
AMERICAN MONORAIL
ENGINEER

(*Continued from page* 82)
contactor which is interlocked electrically with the controller. Truck has two wheel drive and four wheel steer. A 500 per cent overload, heavy-duty and high torque motor is direct connected to free coasting worm and gear. It is claimed that all parts are easily accessible and design is such as to permit truck to travel over uneven floors without transmitting strains to mechanism.

A dynamic brake supplements the travel brake and a solenoid brake on the hoist motor locks the load in position unless released by the application of power. Regenerative braking supplements the solenoid brake and returns current to battery when the load is lowered. A ratchet protects the mechanism at the bottom of down travel of load and an electric clutch protects mechanism at the limit of up travel, and when overloaded.

Eye Protector

Jackson Electrode Holder Co., Detroit, has developed a new device for eye protection which, while not intended to replace goggles, has many applications. The eyeshield



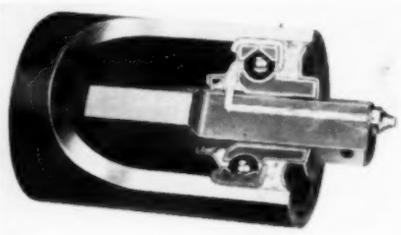
The eyeshield is made in three types for different applications

shown in the accompanying illustration consists of a light headgear to which an assembly consisting of a lens frame and two side protection members is attached. The entire assembly can be pushed up out of the way when not in use. Lens frame swivels to adjust lens angle, and provision is made to permit adjustment of the distance of the lens from the face.

The eyeshield is made in three types. One for blowtorch work, gas cutting and general maintenance welding has lens frame and side pieces of light opaque material. Another model for gun, spot and flash welding, pouring metal and general grinding operations has lens frame and side protection shields of transparent noninflammable material. A third type for gas welders on automobile body work and similar production work, gas welding inspectors and welders' helpers has the lens frame cut away sufficiently on the under side to allow vision under the lens. That permits the wearer to walk around his work, pick up tools, etc. without raising the lens.

Roller Bearing

Standard Conveyor Co., North St. Paul, Minn., recently has developed a new protected bearing, shown in the illustration, for use in foundries where sand and grit are present.



Protected bearing has double inner shield

Features of the grease packed bearing are a shield pressed on the inner ball race with the outer edge flared out to throw the sand outward. The new design has a double inner shield added, the inner part of which is stationary and has a hexagon hole fitted snugly on the shaft. This is claimed to maintain the supply of grease much longer than the former design.

Greasing is done through the back so that the bearings are also flushed. It is claimed experience has proved the opening should be at the outside of the shield as the momentum of the rollers will carry the dirt outward and throw the dirt away from the roller.

Welding Helmet

Industrial Products Co., 800 W. Somerset street, Philadelphia, is manufacturing a chrome leather welding helmet designed for electric welding in tight places where a shield requires too much space. A

Leather helmet is designed for electric welding in tight places

vulcanized fibre headgear is form fitting and adjustable to various head sizes; adjustment is made without use of tools by a screw fitting. The leather is cut well down the back and front, giving protection to the face and ears.

The outer section of the composition glass holder with welding and clear cover glass flips up for weld inspection, actuated by springs enclosed in the hinge joints. A slight projection on both lower sides provides thumb space for flipping. Clear glass in the stationary section of the glass holder remains before the eyes when front is raised.

Pillar Jib Crane

Designed for use in side bays, low head room areas and other confined spaces the new self supporting pillar jib crane recently placed on the market by Harnischfeger Corp., 4400 West National avenue, Milwaukee, is built in capacities up to 5 tons, heights up to 20 feet and to a maximum radius of 20 feet. The jib arm is built to operate on roller bearings.

This type of crane may be ob-

Pillar jib crane is built in capacities up to 5 tons

tained with either pendant rope or push button controls on the hoist or it may be equipped with push button, variable speed control which governs all lifting, lowering and traveling operations. Installation of this crane is made without revamping existing supports.

Automatic Valve

Automatic shut-off valve that shuts off the supply when there is a break in flexible hose conveying compressed air, steam, gas, or fluids under pressure, now is being manufactured by D. J. Murray Mfg. Co., Wausau, Wis. The valve operates on the principle of equalization so that, as long as the pressure at the inlet and the outlet are nearly the same, the plunger is kept open by a spring, permitting the air, steam or other supply to flow through in normal manner.

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ABRASIVE

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These bags of "Cleanblast" — The Tempered Abrasive—are on their way to prove to users our claims of faster, cleaner blasting operations.

Comparative impact tests and actual foundry cleaning room costs prove "Cleanblast" metal shot and grit to be far ahead of any other metallic abrasive. A trial of "Cleanblast" will convince you.

We manufacture every pound of "Cleanblast" shot and grit in our own specially equipped plant.

Sizes for all purposes:

Shot from No. 5 to No. 30

Grit from No. 10 to No. 100

Good castings deserve the best "CLEANBLAST"!

Write for full information

ALLOY METAL ABRASIVE COMPANY

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SIMPLICITY SHAKE-OUTS

LOW COST OPERATION

DEPENDABLE and EFFICIENT

There is no job too big for the Simplicity Shake-outs. Units now in operation are handling flasks weighing over 40 tons. The 8' x 10' dual type shake-out illustrated here has a safe unit load capacity of 20 tons. Have our engineer check your foundry and recommend a guaranteed installation of Simplicity Units.

SIMPLICITY ENGINEERING COMPANY

Durand, Michigan

Roller Bearings

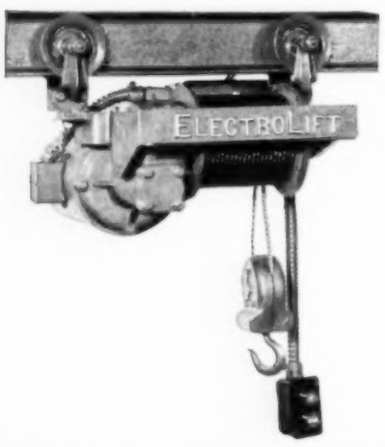
Link-Belt Co., 307 N. Michigan avenue, Chicago, has placed on the market a line of radial-thrust single-row and double-row roller bearings

Thrust capacity is provided by the angular position of the curved rollers between curved races

in the naked or unmounted form. No provision for misalignment need be made in bearing housings or mountings. Thrust capacity is provided by the rollers and race-way shapes and by the angular position of the curved rollers between curved races. Radial or thrust or any combination of radial-thrust loads are carried on the same full contact area under various conditions of alignment. Free rolling action with unimpaired loading capacity is claimed for these bearings, even in the presence of shaft deflection or misalignment. It also is claimed there is no possibility of rollers pinching or binding, and no need for auxiliary means of taking the thrust.

Midget Hoist

Lifting capacity ranges from 125 to 500 pounds in a new line of small electric hoists recently introduced by the Electro Lift, Inc., 30 Church street, New York and shown in the accompanying illustration. The hoist may be supplied for monorail application, either single or twin hooks, or for base mounting for hatchway application. It is claimed that this small hoist is particularly useful for rapid handling of small loads in production plants. The hoist has worm drive on tapered roller bearings, fully enclosed in gear case and running in oil bath. The motor has ball bearings and is attached directly to the hoist frame. Head room is enclosed between the hook and overhead track and the hoist is equipped with enclosed safety type hook block. The motor is equipped with electric brake and automatic electric upper limit switch. The control may be either rope or push button type.



The unit may be equipped with either rope or push button control

Portable Grinder

Black & Decker Mfg. Co., Towson, Md., has announced two new high speed portable grinders with wheel size capacities of 2 inches and 2½ inches. These are precision tools, having a noload speed of 19,000 revolutions per minute, an overall length of 13½ inches, and weights of 3½ and 4½ pounds, respectively Since these grinders have been designed for use where small size wheels are required, they are said to be quite versatile in their application.

Precision grinder is designed for use where small size wheels are required

Furnace Heater

Industrial Gas Engineering Co., Inc., 203 E. Ohio street, Chicago, has introduced new automatc oil-fired recirculating convection type heaters designed for application to existing drawing, annealing, stress relieving, and other furnaces and heat treating equipment. The heaters are offered in several sizes ranging from 500,000 to 5,000,000 B.t.u. per hour with air circulating capacities of 5000 to 60,000 cubic feet per minute. Combustion units, with ignition, safety and temperature controls, and circulating fans are assembled on common bases. Both combustion units and fans are of double walled construction, with heat resisting alloy inside, steel plate outside, and insulation in between. Flanged connections for ducts are provided in any desired positions to facilitate installation on top or beside the furnace or oven. The fans are designed to handle large volumes of air.

Oilfired recirculating convection heaters are completely automatic in operation

Heaters are automatic in operation; features include automatic ignition, relighting, and fuel shut-off. Oil burners and temperature controls are of the proportioning type, and it is claimed they eliminate wide fluctuations in circulated air temperature and make possible maintenance of furnace temperature uniformity. Indicating or recording instruments are supplied with heaters.

Magnifier Mirror

Combination magnifier and mirror is a new instrument manufactured by Bausch & Lomb Optical Co., 635 St. Paul street, Rochester, N. Y. The folding instrument is designed as an addition to first aid kits for use in removing dust or particles from the eye when a physician is not available. With the 3-power magnifier over the mirror a self-examination of the exterior of the eye can be made.

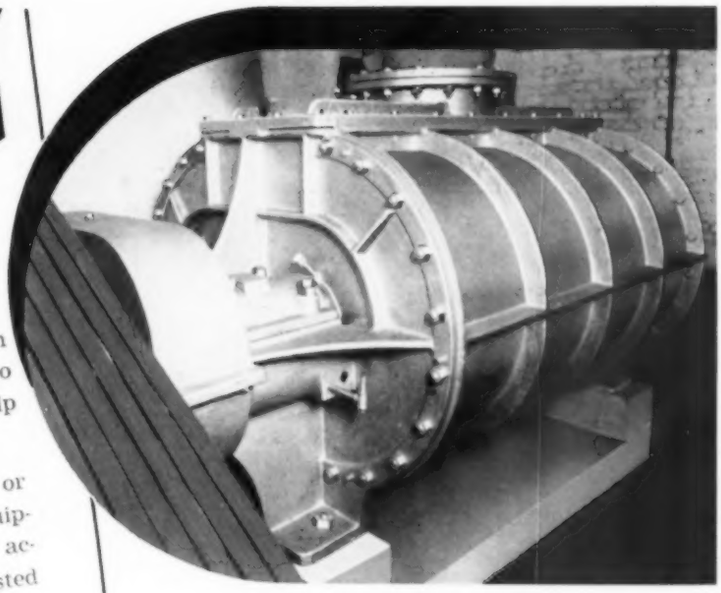
Steel Stamp

Steel stamp to be inserted in a pneumatic hammer to mark rough castings prior to finishing is a new product of the M. E. Cunningham Co., 155 East Carson street, Pittsburgh. The manufacturers claim that this pneumatic hammer stamp will withstand severe shock and will not mushroom or spall. Stamps are supplied in ½ and ⅝-inch sizes for the average hammer and as large as 1 to 1½ inches for large ham-

(Concluded on page 88)

Stamp for use in pneumatic hammer to mark rough castings before finishing processes

PROFITS THAT DEPEND ON *air*



Check your cost sheets. Are you using too much coke? What percentage of your castings do you lose? Would a saving in power costs help profits?

With every casting you are taking a loss or making a profit for which your blower equipment may be partially responsible. Air in accurately controlled volume can save wasted coke and unnecessary scrap losses.

The right blower for your specific requirements, developed and proved during the 84 years we have served the foundry industry, is ready to produce those profits that depend on air. You will find the complete facts interesting.

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Adjustable Speed Alternating Current

GRINDER

MODEL NO. 65

Equipped with electric interlock to prevent operation unless gears are in mesh.

BALL bearing; four speeds available — an exclusive U.S. patented feature — highest power transmission efficiency with lowest replacement costs of wheels and drive; fastest production. Speed change by hand lever on front of machine.

7½ to 15 h.p. for 220, 440 or 550 volts

Write for details.

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO, U.S.A.

1 PEERLESS FLASK

PLUS 6 OR 8 ADJUSTABLE POURING JACKETS

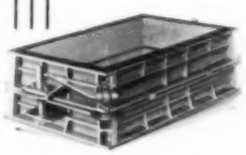
equals the output of

75 TO 150 ORDINARY FLASKS!

AND COSTS ONLY ¼ AS MUCH TO EQUAL THE OUTPUT!

It's a fact!—WOOD'S Peerless Flasks save seventy-five cents of each new equipment dollar. *Exclusive WOOD'S features make the difference* . . . every move of the molder counts, speeds production, lowers your costs.

You'll want details—and they're yours without obligation. A note on your letterhead will bring you all data.



T. B. WOOD'S SONS CO.
CHAMBERSBURG, PA.
50 Church St., New York City 387-391 Atlantic Ave., Boston

(*Concluded from page* 86)

mers. Trade mark designs as well as letters and figures are obtainable. By use of the pneumatic hammer the stamp can be driven into the object to be marked as far as the background of the character and thus prevent obliteration of the mark during finishing processes.

Scoop Truck

Barrett-Cravens Co., 3255 West Thirtieth street, Chicago, recently placed on the market a new scoop truck which is designed for handling

Truck is 19¼ inches wide and 54 inches high

any type of crate, case, tote box, barrel or other plant container. The truck is claimed to be designed so that the load is directly on the wheels and axle and not on the trucker's arms. The truck is made entirely of welded steel. It is 19¼ inches wide overall and stands 53 inches high. The wheel is six inches in diameter.

Lighting Cable

Lighting cable that is claimed to be moisture proof is the new product recently announced by Sullivan Machinery Co., Michigan City, Ind. The cable consists of No. 10 two-conductor, rubber covered cord on which end connectors and lamp socket connectors are molded. Detachable lamp sockets are of molded rubber or bakelite with prong type connectors. The lamp shell is removed and replaced by two small screws within the rubber socket. Webs are vulcanized into the cable above each lamp connection by which the lamp can be hung.

Surface Grinder

U. S. Electrical Tool Co., Cincinnati, has introduced a new portable surface grinder designed for work ordinarily done by straight alternating current grinders. This model, No. 2500, is built in two sizes for continuous production service in foundries, railroad shops, body shops, and machine shops on grinding, buffing, polishing and sanding operations. The motor is supplied for 220 volt 50 to 60 cycle, 3-phase alternating current only, although it may be used on 440 volts with a portable dry transformer. An air cleaner keeps dirt and dust from entering the motor; ball bearings are grease-packed in dustproof housings. The grinder is equipped with grinding wheel, wheel guard, grip handle, and 25 feet of conductor cable.

Electric Etcher

Ideal Commutator Dresser Co., Sycamore, Ill., has announced the addition of an electric etcher to its line of electric tools. Used in the same manner as an ordinary lead pencil, the etcher marks on tools, gages, dies and hard metal parts. Depth of the mark is controlled by the speed at which the point is moved over the metal and also by changing a switch on the transformer. The equipment consists of a fibre handle with two points, a work plate and 5 feet of flexible wire with a carbon rod resistor and connector halves for attaching to a transformer. One of the points is of copper that may be sharpened for fine marking and the other point is of a special alloy for ordinary marking.

Centrifugal Pump

Ingersoll-Rand Co., Phillipsburg, N. J., manufactures an end suction centrifugal pump built in capacities up to 1000 gallons per minute for heads up to 500 feet. The pump offers single or two stage construction, open or closed impeller, and a variety of drives including electric motor, steam turbine, gasoline engine or belt. This pump has been used to pump water, gasoline, fuel oil, caustic soda, quenching oil, and other heavy liquids.

Electric Arc Saw

Miller Electric Mfg. Co., Appleton, Wis., has developed an electric arc saw which is claimed to cut any ferrous or nonferrous metal or alloy readily, and to leave the surface of the cut clean and smooth. Cuts are made by a controlled electric arc which leaps ahead of a soft alloy steel circular blade with numerous, straight teeth, and driven at high speed. The saw blade functions only to sweep the molten metal from between the kerf lines, and as an electrode from which the heat generating arc jumps to the work which is being cut.

To generate the arc between saw and work, a specially built, welding transformer provides current of suitable voltage and amperage. A range of models of the electric arc saw is available to handle different types of production which include cross cutting, slotting, turning, threading, milling, and other types of machining operations.

Hardness Testing

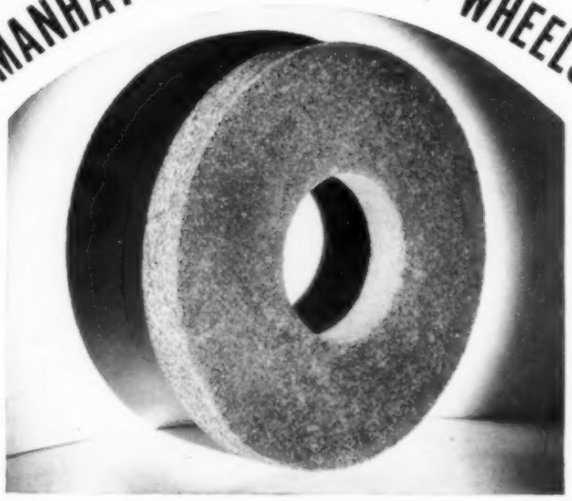
Herman A. Holz, 167 East Thirty-third street, New York, is marketing a new, reflex type Vickers' hardness testing machine which shows a greatly magnified image of the diamond pyramid indentation. The machine, depicted in the accompanying illustration, is said to facilitate correct performance of the test, and to reflect the image of the indenetation magnified 70X or 140X as desired. Hardness of materials from

After the indenter is released a greatly magnified image of the indentation appears directly in front of the operator

tin to tungsten carbide, and from thin sections down to 0.0016-inch, and heavy sections, can be determined. Maximum height of test piece that can be accommodated is 11.8 inches, and the distance from the indenter to machine frame is 5.9 inches. Twenty different test loads are provided on the hardness testing machine and they range from 1 to 250 kilograms.

for HEAVY FOUNDRY SNAGGING . . . CUTTING OFF . . .

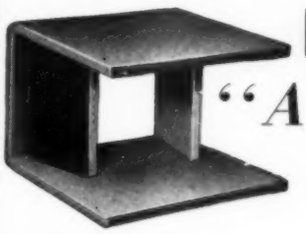
MANHATTAN ABRASIVE WHEELS



Grind accurately, wear evenly and do your job at lowest cost. Engineered for the task after careful study of conditions. Consult our

ABRASIVE WHEEL DEPARTMENT

THE MANHATTAN RUBBER MFG. DIVISION
OF RAYBESTOS-MANHATTAN, INC.
Executive Offices and Factories, 77 Townsend Street, Passaic, N. J.



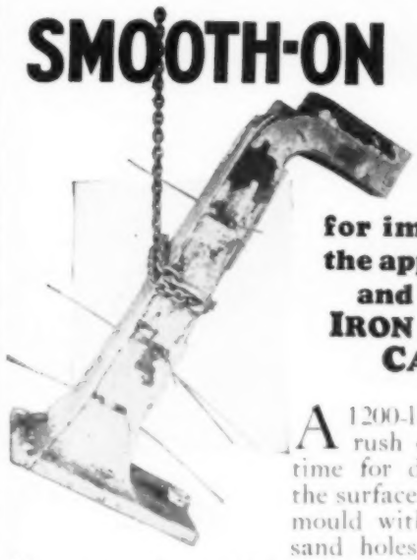
MILWAUKEE *"ANGLE"* CHAPLETS

"MEET" the new addition to our line, and a fit companion to the famous MILWAUKEE THREAD STEM Single and Double Head Chaplets.

"Use" MILWAUKEE 'ANGLE' CHAPLETS—they are indispensable for some jobs. Write for prices and information. Also test our unequaled service.

MILWAUKEE CHAPLET & MFG. CO.
1023 So. 40th St., Milwaukee, Wis.
Manufacturers of Foundry Chaplets, Galvanized Riddles, Kordo Core Paste, Tripolex and Non Silica Partings

SMOOTH-ON No. 4



for improving the appearance and sale of IRON and STEEL CASTINGS

A 1200-lb. casting — rush order — hardly time for delivery — and the surface comes from the mould with a lot of little sand holes and air holes. None are where vital strength is impaired, but some show up like a sore thumb. Are you going to recast at big expense to yourself and costly delay to your customer—or invite his condemnation of your product and your service as unreliable?

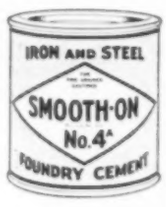
Progressive foundrymen do neither—but take advantage of SMOOTH-ON No. 4 to save the day. With ten minutes work and an hour's wait for hardening, they transform all the spots and pits into smooth metallic iron surface of the same color and texture as the surrounding metal.

Three compositions, each with distinct color, degree of lustre and fineness of grain offer a choice for perfect match in iron and steel castings of any shade, appearance and quality.

Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish.

Smooth-On No. 4A. For medium gray castings. A fine-grained cement that has a good metallic lustre.

Smooth-On No. 4B. For dark gray castings. A cement of coarser grain and darker shade.



FREE
HARDENED and WORKING
SAMPLES

Smooth-On Nos. 4AA, 4A and 4B is packed in 1-lb. and 5-lb. can, 25-lb. pail or 100-lb. keg. Mail coupon for prices and free hardened and working samples.

Smooth-On Mfg. Co., Dept. 17,
570 Communipaw Ave., Jersey City, N. J.

Please send samples of ☐ Smooth-On No. 4AA ☐ Smooth-On No. 4A ☐ Smooth-On No. 4B

Name .....

Address .....

9-38

Do it with **SMOOTH-ON**

FOUNDRY ACTIVITIES

CONEMAUGH SANITARY MFG. CO., Blairsville, Pa., recently reopened the plant of the Conemaugh Iron Works, which had been closed since 1934. Employment has been given 50 men by the new company, which plans to manufacture bathroom and kitchen fixtures and enamel ware.

* * *

Sparta Foundry Co., Sparta, Mich., will erect a one-story addition to its plant. Weemhoff & Steketee, Grand Rapids, Mich., are architects.

* * *

Penn Brass & Bronze Works, 107-117 Dobbin street, Brooklyn, N. Y., has discontinued its foundry.

* * *

Aluminum Alloy Casting Co., 2454 East Fifty-fifth street, Los Angeles, has awarded contract for the construction of a shop and garage addition to its plant. The new building will be 26 x 47 feet and will cost $2500.

* * *

Monarch Foundry Co., 2268 East 15th street, Los Angeles, has moved to 408 South Spring street.

* * *

Carlson & Sandberg Foundry, 407 Twenty-first street, Moline, Ill., recently has changed its name to Sandberg & Sons.

* * *

Sanford Foundry Co., Sanford, N. C., has changed its name to the Lee Iron Works.

* * *

Machined Steel Castings Co., 1450 Mahoning avenue, Alliance, O., recently resumed operations on a 5-day week basis. The plant was idle during July.

* * *

Somerville Iron Foundry Co., 88 Washington street, Somerville, Mass., will be merged with the Mechanics Iron Foundry Co., 38 Kemble street, Boston.

* * *

Liquidation sale and auction of equipment for iron and brass foundry, pattern shop, enameling shop, enamel mill room, mounting warehouse, and ornamental iron shop

(*Concluded on page* 92)

Large Important Auction

LIQUIDATION SALE

In the matter of: J. L. Mott Corporation

Valuable Real Estate, Machinery, Equipment

2,000 TONS CAST IRON FLASKS, PATTERNS AND SCRAP

J. L. MOTT CORPORATION

Lalor & Hancock Sts., Trenton, N. J.

Manufacturer of

IRON • BRASS • ENAMEL WARE

To Be Sold on the Premises at

PUBLIC AUCTION

WEDNESDAY, SEPTEMBER 21, 1938

and Following Days at 10 A. M. (D. S. T.)

IRON FOUNDRY—BRASS FOUNDRY—PATTERN SHOP—ENAMELING SHOP—ENAMEL MILL ROOM—MOUNTING WAREHOUSE—ORNAMENTAL IRON SHOP

POWER HOUSE: 2 CROSS COMP. BUCKEYE 200 K.W. 250 VOLTS, 2 BURY & INGERSOLL COMPRESSORS, 2200 AND 1575 CUBIC FT.

IRON FOUNDRY: 12 5- TO 15-TON CAPACITY OVERHEAD TRAVELING CRANES, 7 SHEPARD AND SHAW ELECTRIC HOISTS.

BRASS FOUNDRY: Tabor Moulding Machines, New Haven Sand Blast Machine, Double Head Grinders, Fisher Furnaces, Brass and Wood Patterns, Flasks, Core Ovens, etc.

ORNAMENTAL MACHINE SHOP: Radial Drills, Prentiss Lathes, Drill Presses, Grinders, Bickford Boring Mill 6', Power Shears and Punches, Speed Lathes, Turret Lathes, Shapers, Bending and Edging Machines.

PATTERN SHOP: Drill Presses, Shapers, Wood Planers and Lathes, Rip Swing and Band Saws; Grinders and Blast Machines, Brass and Wood Patterns, etc.

BRASS SHOP: Swing, Band and Circular Saws, Sharpeners, Pipe Threaders, Polishing Machines, Turret Lathes, Punch Presses, Multiple Drill Presses, Rumblers, Speed Lathes, Drill Presses, Box Machine, Metal Planers, etc.

LINK BELT UNIT (ORIGINAL COST, $110,000.00)

Cupolas, Furnaces, Sand Blast Machines, Ball Mills, Jarring Machines, 5 to 400 H. P. Motors, Blowers, Flasks, Weights, Chain Blocks, Hand and Platform Trucks, Steel Shafting, Leather Belting, Electric Time Clocks, Watchman's Signal System, Shop Tools, Bench Vises, Work Tables, etc.

10 TONS HIGH-SPEED STEEL TOOLS

Inspection Monday & Tuesday, September 19 & 20, 1938

Between 10 A. M. and 4 P. M. or by Appointment

NO CONFIRMATION—IMMEDIATE DELIVERIES

Write for Illustrated Catalog

By Order of Harry A. Robinson, President

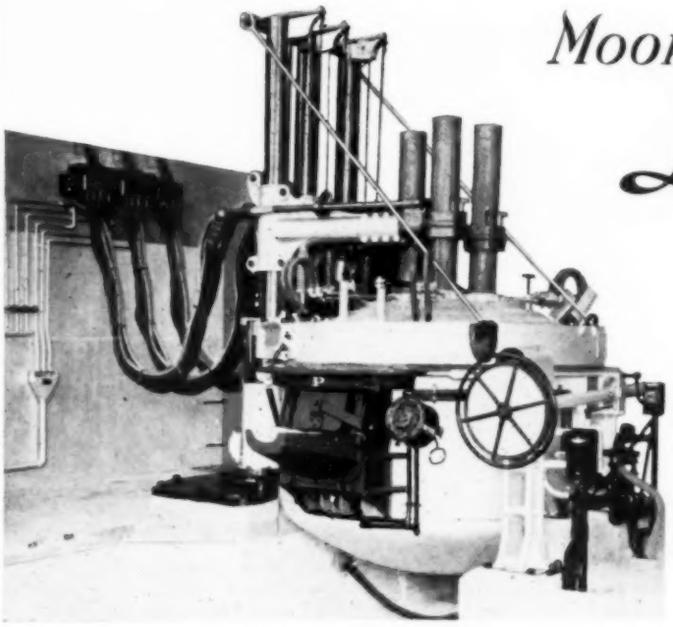
Associated Auctioneers, Inc.

AUCTIONEERS AND APPRAISERS

1915-17-19 CHESTNUT ST., PHILA., Pa.

RAW MATERIAL PRICES
Aug. 20, 1938

Iron	
No. 2 foundry, Valley	$20.00
No. 2 Southern Birmingham	16.00
No. 2 foundry, Chicago	20.00
No. 2 foundry, Buffalo	20.00
Basic, Buffalo	19.00
Basic, Valley	19.50
Malleable, Chicago	20.00
Malleable, Buffalo	20.50
Charcoal iron, furnace	25.00
Coke	
Connellsville beehive premium	$5.75 to $6.25
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	10.25
Scrap	
Heavy melting steel, Valley, No. 2	$13.00 to $13.50
Heavy melting steel, Pittsburgh, No. 2	14.00 to 14.50
Heavy melting steel, Chicago, No. 2	10.25 to 10.75
Stove plate, Buffalo	12.00 to 12.50
Stove plate, Chicago	10.00 to 10.50
No. 1 cast, New York	12.00 to 12.50
No. 1 cast, mchy., Chicago	13.00 to 13.50
No. 1 cast, Pittsburgh	15.00 to 15.50
No. 1 cast, Philadelphia	16.50 to 17.00
No. 1 cast, Birmingham	14.00 to 14.50
Car wheels, iron, Pittsburgh	15.00 to 15.50
Car wheels, iron, Chicago	14.50 to 15.00
Railroad malleable, Chicago	15.50 to 16.00
Malleable, Buffalo	13.50 to 14.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	9.65
Straits tin	43.00
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	13.75 to 14.25
Lead, New York	4.90
Antimony, New York	10.75
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.75



Furnaces available in top charge type with quick raise and swing roof—also in door charge types.

Moore Rapid

Lectromelt

Furnaces

for

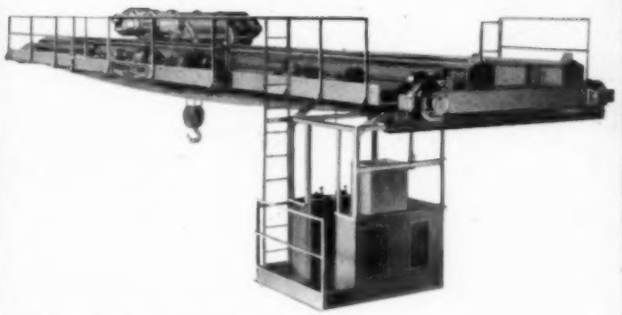
MELTING
REFINING
SMELTING

Alloy and Carbon Steels
Gray and Malleable Irons
Copper and Nickel and Alloys
Ferro-Alloys, Carbide, and Special products

RAPID—ECONOMICAL—RUGGED

PITTSBURGH LECTROMELT FURNACE CORP.
Foot of 32nd Street, Pittsburgh, Pa.

ELECTRIC TRAVELING CRANES
1 TO 450 TONS CAPACITY



Every Detail of the Most Advanced Design

SHEPARD NILES CRANE & HOIST CORP.
360 SCHUYLER AVENUE, MONTOUR FALLS, N. Y.
A COMPLETE LINE OF CRANES AND HOISTS

Revolutionary Pattern Making Machine!

"OLIVER"
No. 103
UNIVERSAL PATTERN MILLER

For both Wood or Soft Metals

Regardless of the size of your pattern shop this new pattern miller can definitely improve quality, cut costs, enlarge production and thereby increase profits. Practically every operation in the making of patterns can be handled on it, including gear cutting, intricate fillet cutting directly into pattern, and many delicate operations formerly necessitating slow hand work.
A 12-page bulletin describing and illustrating this new pattern miller and specimens of its work is yours for the asking . . . write for it today.

Oliver Machinery Company
Grand Rapids, Michigan, U.S.A.
HIGH GRADE MACHINERY

(*Concluded from page* 90)

will be held at J. L. Mott Corp., Trenton, N. J., Sept. 21.

* * *

A certificate to conduct business under the firm name of Arrow Brass Foundry Co., at 733 New High street, Los Angeles, has been issued to the owners: D. E. Gilbert, of 3565 Arroyo Seco avenue; P. Marengo, of 3121 Cazador street, Los Angeles; and Mario Marengo, of Williams, Calif.

* * *

The Foundry was incorrect in reporting in the August issue that the Pullman-Standard Car Mfg. Co., Chicago, will build an addition to its Michigan City, Ind., wheel plant. The company at least for the present will continue to operate its present wheel foundry, except with minor modifications and rehabilitation, which may be classed as maintenance.

* * *

Index of foundry equipment orders for July, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 74.2 as compared with 61.2 in June and 204.0 in July, 1937. Index of shipments was 105.8 as compared with 78.5 in June and 216.5 in July of last year.

NEW TRADE PUBLICATIONS

Copies of any of the literature listed below may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

DUST COLLECTOR — W. W. Sly Mfg. Co., 4700 Train avenue, Cleveland, has published a bulletin on its centrimerge wet dust collector. Information covers design and operation as well as features claimed for the unit.

VALVES—Bulletin 5-7000 describes a redesigned line of forged and cast steel valves made by Hancock Valve division, Manning, Maxwell & Moore Inc., Bridgeport, Conn.

AFTERCOOLERS—Sullivan Machinery Co., Michigan City, Ind., has issued bulletin A-21 which describes the company's compressed air and gas aftercoolers, which are available in six sizes.

CRUCIBLES — Crucible Manufacturers association, 90 West street, New York, has published a 16-page booklet with suggestions for storing, handling and using crucibles.

ENAMELING—Diagram and explanation of the continuous flow process of producing enamel frits are contained in a folder recently published by Ferro Enamel Corp., 4150 East Fifty Sixth street, Cleveland.

PUMPS—Complete specifications and operating characteristics of two-stage centrifugal pumps made by the Cameron Pump division are described in a 16-page bulletin recently issued by Ingersoll-Rand Co., Phillipsburg, N. J.

LACQUER—Bulletins No. 23-L and No. 15-S recently published by Hilo Varnish Corp., 42-60 Stewart avenue, Brooklyn, N. Y., describe its metallic colored lacquer and a new gloss with wave line effect finish.

DUST CONTROL—Western Precipitation Corp., 1016 West Ninth street, Los Angeles, has published a 24-page booklet describing its activities in research, development and construction of dust and fume control equipment.

TRANSMISSIONS — "New Horizons" is the title of a new 12-page bulletin describing variable speed transmissions manufactured by the Texrope division, Allis-Chalmers Mfg. Co., 1126 South Seventieth street, Milwaukee.

ELECTRIC MOTORS—Three bulletins issued by U. S. Electrical Motors Inc., 200 E. Slauson avenue, Los Angeles, describe the method used in insulating, winding and ventilating its motors and also the features of its automatic starting grinders and buffers.

VIBRATION—Korfund Co. Inc., Long Island City, N. Y., has published a paper on the nature and control of vibration which was given by Mr. Rosenzweig at the Ninth National Oil and Gas Power meeting held under the auspices of the American Society of Mechanical Engineers.

ELECTRIC TOOLS—New 48-page catalog issued by the Independent Pneumatic Tool Co., 600 West Jackson boulevard, Chicago, gives descriptions and specifications of its line of portable electric tools including drills, drill stands, saws, hammers, grinders, polishers and sanders.

MEASUREMENT—"When You Can Measure" is the title of a 32-page book recently published by General Electric Co., Schenectady, N. Y., which describes design, construction and testing of measuring instruments made by that company.

LATHES—New bulletin published by R. K. LeBlond Machine Tool Co., Cincinnati, contains diagrams of rapid production lathes, combinations of tool rests and blocks, automatic controls and attachments as well as detailed diagrams of tool set-ups and many specifications.

VIBRATORS — Syntron Co., Homer City, Pa. has published two folders dealing with the application of its electric vibrators to hoppers and feeder conveyors as a means of providing for a free flow of materials. Illustrations show construction and application.

ELECTRICAL EQUIPMENT—Recently issued bulletins Gea-432c, Gea-841h, Gea-2742 and Gea-1929a of the General Electric Co., Schenectady, N. Y., describe direct current generators and exciters, alternating current magnetic switches, capacitors and gear motors.

BELT IDLERS—C. O. Bartlett & Snow Co., 6200 Harvard avenue, Cleveland manufacturers of bulk material conveying and elevating equipment, have published "Belt Conveyor Idler Bulletin No. 80" which illustrates and describes in detail a new line of belt idlers.

ELECTROTINNING—E. I. du Pont de Nemours & Co. Inc., Wilmington, Del., has published a 12-page manual describing practice for operations of its sodium stannate-acetate process. Standard methods for preparing, controlling and analyzing the solution are given.

HANDLING—Lewis-Shepard Co., 280 Walnut street, Watertown, Mass., manufacturer of material handling equipment, recently issued circular No. 323 which illustrates and describes ways of attaining greater safety in indoor transportation of materials.

REFRACTORIES — A new 12-page booklet entitled "How to Reduce Spalling with Super Duty Refractories" has been published by the General Refractories Co., Philadelphia. The booklet gives charts, tests and general information on the types of refractories made by that company.

LATHE TOOLS—"Turret Lathe Tools" is the title of a 180-page book recently issued by Warner & Swasey Co., 5701 Carnegie avenue, Cleveland. The book is filled with illustrations, diagrams, tables and data sheets covering chucking, bar and cross slide tools and holding devices.

TEMPERING — Leeds & Northrup Co., 4934 Stenton avenue, Philadelphia, has published a 36-page catalog describing the Homo method for tempering. Information deals with varieties of work being tempered, annealed or normalized in furnaces produced by the company.

PIPE REPAIR—How to repair leaks quickly, without taking the pipe line out of service, is the subject of the "Pipe Repair Handbook," published by M. B. Skinner Co., South Bend, Ind. It discusses all the various kinds of leaks in pipe lines—holes, splits, pitted or corroded sections, threaded joints, bell and

(*Concluded on page* 94)

Faked Foundry Facts

"Bull Ladle"

"I'M A BLAST CLEANING OPERATOR

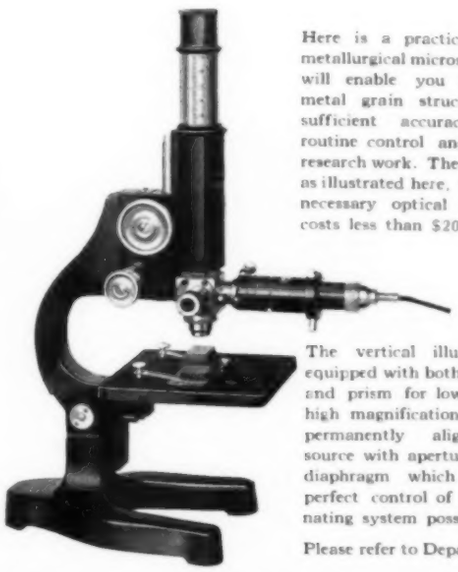
. . . . and I take pride in my work. I KNOW from EXPERIENCE most of the things you higher-ups READ ABOUT. I know HOW to get good production from our blast-cleaning equipment and I know HOW to keep the cost DOWN. If I didn't, I'd soon lose my job.

"But there's no WORRY about THAT! The boss and I both agree on the one thing that does most to keep costs down and quality up . . . . 'CERTIFIED' Steel Abrasives! Through many years of trial we are convinced that in using 'CERTIFIED' Steel Grit for a matte finish on metallizing, enameling or plating jobs—and 'CERTIFIED' Steel Shot for work where the rolling or ball-pein hammer action is required—will save any shop real money. Save power, compressed air, rejects, dust trouble, and labor. I KNOW, Mister, because I use 'CERTIFIED' Abrasives EVERY DAY."

GRADED TO UNIFORM DEPENDABLE SIZES FOR EVERY NEED

PITTSBURGH CRUSHED STEEL CO.
PITTSBURGH, PENNA.
STEEL SHOT AND GRIT CO.
BOSTON, MASS.

A Complete
Metallurgical Microscope
for less than $200.00



Here is a practical, upright metallurgical microscope which will enable you to analyze metal grain structures with sufficient accuracy for all routine control and ordinary research work. The instrument as illustrated here, with all the necessary optical equipment, costs less than $200.00.

The vertical illuminator is equipped with both glass plate and prism for low as well as high magnifications. It has a permanently aligned light source with aperture and field diaphragm which makes a perfect control of the illuminating system possible.

Please refer to Department IV.

E. LEITZ, INC. 730 FIFTH AVENUE, NEW YORK, N. Y.
WASHINGTON · CHICAGO · DETROIT
Makers of the famous LEICA Cameras | Western Agents: Spindler and Sauppe, Inc., Los Angeles · San Francisco

STOW
FLEXIBLE SHAFT
Standard
The World Over
For 63 Years

REAL POWER TOOLS
for
GRINDING, SANDING, POLISHING, BUFFING, SCRATCH BRUSHING, DRILLING, DIE SINKING, ROUTING AND PATTERN FINISHING.

10 Different Mountings
High or Low Speeds—⅛ to 10 H. P.

Write for Catalog 38

STOW
MFG. CO. INC.
23 Shear St.
Binghamton, N. Y.

(*Concluded from page* 92)

spigot joints, welded joints, and collars —and suggests what repairs may be made without service interruptions.

CONTROL GAGE—Edwin S. Carman Inc. 1643 Lee road, Cleveland, has issued a brief leaflet called "Carman Cupola Control System" which deals with the cupola control gage and its use in varying the volume of air blast to prevent defective castings.

REFRACTORY CEMENT—Refractory & Insulation Corp., 381 Fourth avenue, New York, recently issued a bulletin describing three varieties of refractory cements and their use for monolithic construction, for poured or cast shapes and for replacing fire brick.

CERAMICS — "Research for Ceramic Industries" is the title of a 16-page picture-story published by Battelle Memorial institute, 505 King avenue, Columbus, O. Illustrations show the work of the institute in research on abrasive, cement, glass, pottery and refractory products.

PYROMETER—Recently issued bulletin 300 describes in detail with diagrams the optical pyrometer manufactured by Bacharach Industrial Instrument Co., 7000 Bennett street, Pittsburgh. Bulletin 299 and leaflet 301 describe the radiation pyrometer manufactured by that company.

ENAMELING TOOLS—A revised edition of "Bob's Burning Bar Booklet" recently has been issued by Ferro Enamel Corp., 4150 East Fifty Sixth street Cleveland. The booklet shows sketches of patterns of heat-resisting alloy tools used for burning porcelain enameled wares.

TRACTORS — Elwell-Parker Electric Co., 4205 St. Clair avenue, Cleveland, has published a pocket size booklet of 32 pages illustrating its trucks, tractors, cranes. Illustrations show mechanical details of the various machines and each illustration is accompanied by a set of specifications.

METALS—"6 Minutes with 6 Metals" is the title of a 16-page booklet recently issued by the International Nickel Co. Inc., 67 Wall street, New York, which gives the characteristics and uses of nickel, monel and allied alloys. Another booklet describes monel gaskets, pump parts and valves.

SOCKET INSTRUMENTS — Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., recently published a 20-page pamphlet which describes its line of ammeters, voltmeters, wattmeters, watthour meters, recorders and test jacks which are made to plug into self supporting sockets designed by the same company.

RESPIRATOR—Mine Safety Appliances Co., Braddock, Thomas and Meade streets, Pittsburgh, has issued a bulletin describing a new air line respirator which provides protection against welding and cutting fumes, paint spray vapors and pigments, fumes from molten metals, toxic dusts, etc.

FURNACE WALLS—Bulletin No. 301 entitled "Wall and Arch Construction" recently was published by George P. Reintjes Co., 2517 Jefferson street, Kansas City, Mo. Many illustrations and diagrams show wall construction of tile, brick and castings and also many arches and arch nosing combinations.

WELDING ELECTRODES — Harnischfeger Corp., 4400 West National avenue, Milwaukee, has published a bulletin giving information and data on each of its welding electrodes. The bulletin includes spar tests, procedure sheets and other informative suggestions to make it a valuable reference for welder users and operators.

WOOD PATTERNS — Western Pine association, Yeon building, Portland, Oreg., has published a 20-page booklet, "Idaho White Pine Ideal for Wood Patterns," which shows the use of Idaho white pine for patterns, core boxes, and foundry flasks. Physical and mechanical properties of Idaho white pine for pattern shop use are given.

ALLOY CASTINGS — American Manganese Steel Co., 389 East Fourteenth street, Chicago Heights, Ill., has published a catalog on the various products and equipment parts made from alloyed metal. Included among them are valve seats, heat treating furnace parts, clinker cooler spouts, furnace grates, stirrers, pans, agitator arms, tube supports, flasks, shafts, housing plates, rolling mill guides, furnace disks, etc.

CAST IRON PROGRESS — International Nickel Co., has reprinted the Howe Memorial lecture given by Paul D. Merica on "Progress in Improvement of Cast Iron and Use of Alloys in Iron." Included is a discussion of the present widespread use of nickel cast irons for camshafts and crankshafts of gasoline and diesel engines, as well as for gears, cams, dies and other applications where strength, toughness, and wear resistance are required.

ELECTRODES—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued a new folder which describes its alternating current welding electrodes. It has also issued a bulletin describing the features, construction, and application of its small alternating current welders. Specifications and operating costs are included together with a list of questions and answers covering the use and operation of the welders.

CASTINGS — Shenango-Penn Mold Co., Dover, O., recently has issued a 2-page bulletin describing its line of centrifugally cast ferrous and nonferrous metals and alloys. Information is given on sizes of solid and tubular stock available for immediate shipment.

AUTOMOBILE ACCIDENTS — Basic reasons for America's shameful automobile accident record in 1937 were too much speed and too little courtesy, according to a new booklet entitled "Death Begins at 40" issued by the Travelers Insurance Co., Hartford, Conn. The booklet presents a complete analysis of last year's traffic accidents, based on official figures from the 48 states.

PLATING — Electroplating Chemicals division, E. I. duPont de Nemours & Co., Wilmington, Del., has published an 8-page bulletin describing its recently developed material for removing carbonate from plating solutions, and how it is used. The bulletin also outlines chemical analysis of carbonates and results of laboratory and commercial tests conducted with cadmium, copper, zinc, and silver baths.

PATTERN PLATES — George F. Pettinos Inc., 1206 Locust street, Philadelphia, recently has issued a 4-page folder describing its new pattern plates made in magnesium alloy. The plates are said to be 35 per cent lighter than aluminum, and possess a tensile strength of 38,000 to 40,000 pounds per square inch. Information also is given on procedure for machining the plates.

ARC WELDING — General Electric Co., Schenectady, N. Y. has published a 12-page catalog of arc-welding accessories with specifications and prices. A pamphlet by the same company describes their gasoline-engine-driven arc welder, the engine being a 60 horsepower Ford V-8. A third publication describes a new thyatron control for spot welders designed to allow more precise timing and more consistent welding.

ROD STRAIGHTENERS — American Foundry Equipment Co., Mishawaka, Ind., has issued an illustrated bulletin on its rod straightener and shear machines, which shows the most popular models and lists some of their uses. Another bulletin, published by the same company, describes the advantages and construction of its blast cleaning tables. And a third publication, recently issued, describes the company's taper strip flasks and pouring jackets.

TRACTORS—Caterpillar Tractor Co., Peoria, Ill., has issued a new folder illustrating and describing the variety of jobs done by its products. Captioned pictures show both old and new uses for the company's diesel engines, track-type tractors, and road machinery. This folder has been supplemented by a small booklet designed to show the uses and power costs of the motors and tractors. Well illustrated, the booklet shows the equipment at work, and gives complete operating costs.

CORE PLATES—Johns-Manville, New York, has issued a folder entitled "Johns-Manville Transite Core Plates and Pallets." Information is given on the light weight and low heat transmission of this asbestos-cement product, and the ability of the material to resist corrosion, warpage, and breakage. Published by the same company, a new edition of its insulation booklet, "Barriers to Industrial Waste," describes in detail more than 50 different insulations for all types of heated equipment.

Part of the large crowd which awaited the opening of the recent Cleveland Exhibition of the American Foundrymen's Association